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H. S. Conrad, *Editor*

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ENROLLMENT INCREASES AND CHANGES IN THE MENTAL LEVEL

of the High-School Population

By

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College of Education
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Urbana, Illinois

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FOREWORD

This monograph will be of special interest to persons advocating secondary education for all American youth. The data here assembled do not lend support to the belief that the pronounced increase of enrollment in high schools since World War I has been accompanied by a decline in either the central tendency or the homogeneity of the ability of high-school students as measured by group intelligence tests.

Unfortunately, no objective measures of intelligence of high-school students were available prior to 1916 with which to validate the claim that the students then attending high school (in 1890 less than 10 per cent of all teen-age boys and girls) constituted a group much more highly selected than later groups totaling from 50 to 75 per cent of teen-age boys and girls.

Estimates of ability of high-school students prior to World War I are of necessity highly unreliable and subject to the gross exaggerations attending the "good-old-days" reasoning.

A study of the data assembled by Dr. Finch will, I believe, serve as a corrective to the faulty reasoning that has resulted from the failure to use available test data. It should stimulate further research to supplement the admittedly inadequate results to date.

There is reason to believe that Dr. Finch's plea for a more widely differentiated postwar high-school curriculum would have been an acceptable educational philosophy to many educators even prior to World War I, when in all probability the individual differences in ability and the variation in interests and needs of high-school students differed but little from those of postwar days.

W. S. MILLER

University of Minnesota

JAN 1955

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Many persons contributed in one way or another to the data collected for this study. School officials in two communities allowed me to administer tests in their high schools. These school men were most helpful in furnishing from their files data regarding enrollment increases. Personnel managers and labor-union officials gave assistance freely when information from their records was needed. The nature of some of the records requested made it appropriate to agree in advance not to identify the sources of certain data. It is for this reason that the localities in which data were collected are unnamed. Numerous professional colleagues also gave assistance for which I am grateful. To Professor W. S. Miller, who long ago recognized the need for such studies and who preserved the early test results that made this work possible, special thanks are due.

F. H. FINCH

Urbana, Illinois

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Chapter I

INTRODUCTION

High schools have expanded rapidly in the United States. The number of pupils enrolled in 1900 was relatively small; by 1940, continuous growth since the beginning of the century had brought high-school enrollment to a total in excess of seven million pupils. No other nation has at any time in history furnished a comparable number of its youth with an equally extensive educational program. The record of expansion of public high-school enrollment in this country is shown in Figure 1 (54).

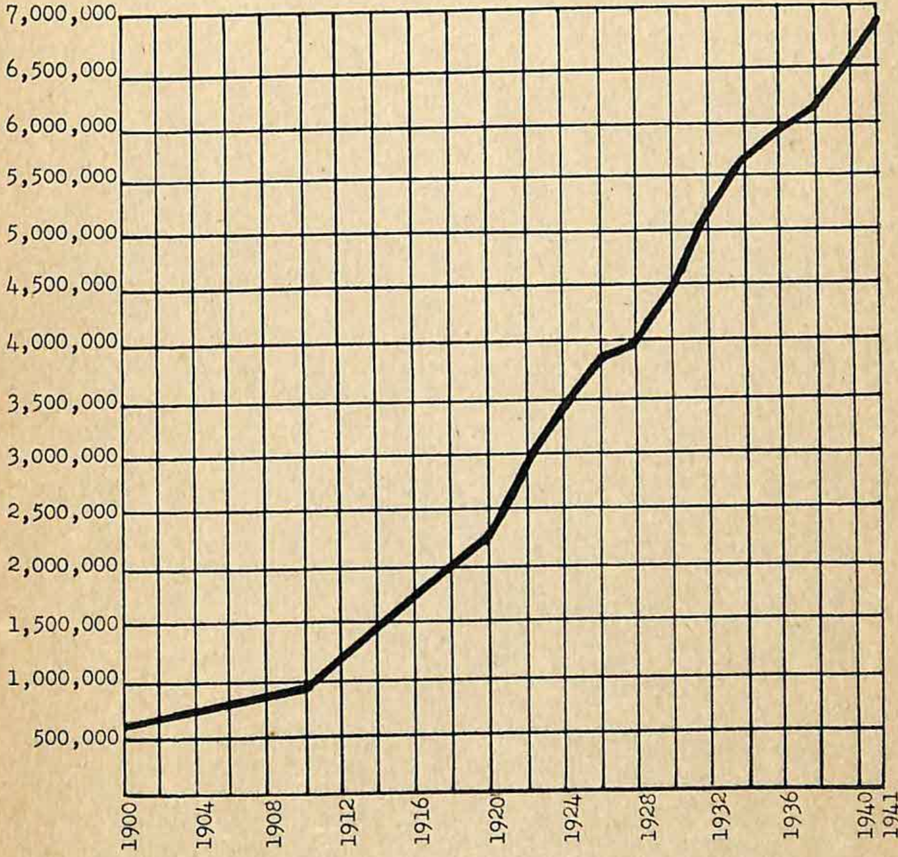

Fig. 1.—Enrollment in public high schools, 1900-1941

Increases in high-school enrollment since 1900 surpassed by far the increment in the total number of youth of high-school age. That is to say, these increases came about through the attendance of greater and greater proportions of all youth from this age group. For example, the total enrollment of all public high schools in the United States in 1900 amounted to about 8 per cent of the entire number of persons between 14 and 18 years of age at that time; by 1920 increases in enrollment had raised this percentage to 28; and in 1940 the comparable figure had become 68 per cent. Since 1900, private secondary-school enrollment has grown from less than 3 per cent to approximately 5 per cent of the total age group served by these schools. When the number of pupils that have been attending private secondary schools is taken into account, it is found that by 1940 there were enrolled in the high schools of this country almost three out of every four persons of high-school age. Figure 2, based upon data from the reports of the United States Bureau of the Census and the Statistical Summary of Education (54), shows more fully how the proportion of youth attending high schools increased during the first four decades of the twentieth century.

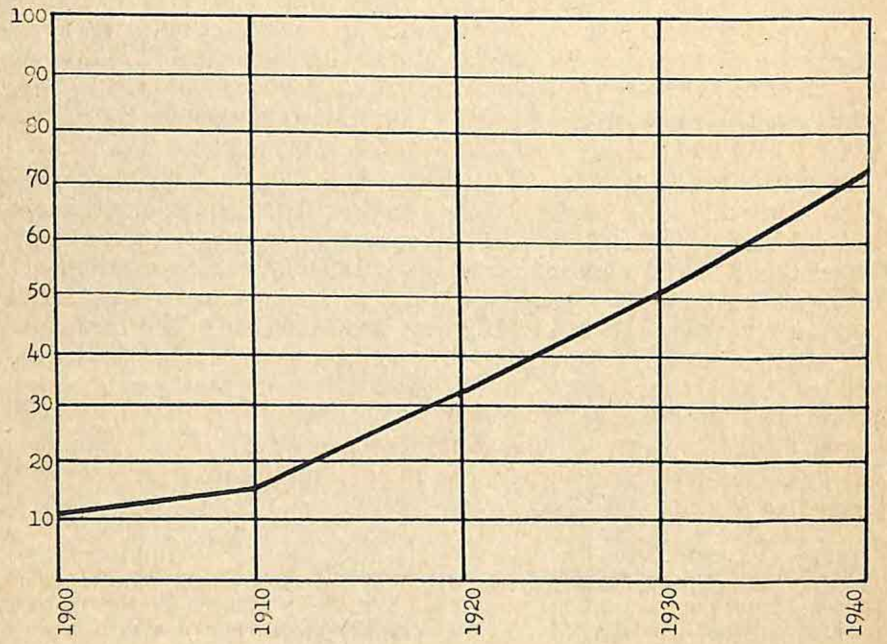

Fig. 2.—Number enrolled in all high schools per 100 population, ages 14-17

This monograph reports the results of research designed to discover whether increases in enrollment have been accompanied by changes in the measured mental ability of the high school's clientele. It is commonly believed that in earlier years the high schools of the United States drew a highly selected group of pupils. The widely quoted study by Counts, based upon data collected in 1919, 1920, and 1921, showed that "in a very large measure participation in the privileges of a secondary education is contingent on social and economic status," (10, p. 149). Numerous other studies at various dates have corroborated Counts's conclusions with respect to socio-economic selection in the secondary schools. While Counts found reasons which led him to conclude that selection with respect to mental ability was not as extreme as that which he observed when studying social and economic factors (pp. 154-55), his caution on this point has not been given much recognition by those who have quoted from the Counts monograph. Instead, authors who followed Counts, as well as those who preceded him, have usually regarded those youth who came into the secondary schools when enrollments were small as representing a highly superior level of mental ability. It is ordinarily held that in earlier years attendance in the high schools of this country was restricted to youth of exceptional intelligence, so that the high-school pupils represented a level of mental ability markedly above that of the population in general. During the period shortly after the end of World War I, when the high schools of this country enrolled approximately one-fourth of all youth of high-school age, those educational writers who were looked upon as the best authorities of the day held that virtually all of the pupils in the high schools at that time were drawn from the most intelligent half of the total youth group.[1] Apparently this view was generally accepted at that time, and it seems to have been questioned but little in more recent years. Beyond this, Thorndike (50) and numerous others who followed him have assumed that even within the more intelligent half of the population there existed a high correlation between intelligence and persistence in attending secondary school. If these were the conditions existing in the high schools, any great increase in the proportion of the total age group attending high school could have been accomplished only by bringing into the high schools persons from an intelligence level inferior to that which had been characteristic of the more select high-school population of the preceding period.

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[1] Thorndike wrote in 1923, "The pupils in academic high schools are in fact a limited group which covers just about half, the upper half, of American intelligence," (51, p. 24). Book, who conducted one of the earliest and most widely publicized state surveys using intelligence tests in high schools, believed that "the high school *seniors* which we tested would fall, in the main, in the *high average*, *superior*, and *very superior* groups if measured by a standard obtained from a large group of *unselected* adults. Those who made scores on our tests which place them in the lowest 5 or 10 percentile group would therefore possess at least *average* intelligence if measured by a standard obtained from an unselected group of adults," (8, pp. 24, 25). Evidence to support this belief is apparently lacking. Adult norms for the test which he used are not mentioned in connection with the statement quoted here.

Those selective factors which went to determine whether or not a particular youth living a few decades ago attended high school are no doubt operating at present to the extent that they exert an important influence upon high-school enrollment. Beyond this, other factors have increased the probability that boys and girls of superior mental ability will continue in high school until graduation. It is obvious, nevertheless, that the large clientele of the contemporary high school in this country is not highly selected on the basis of mental ability, as was assumed to be the case with earlier high-school groups. Recently the proportion of youth enrolled in high school has become so large that even though selection were dependent wholly upon the mental ability of the individual (and this is far from true), approximately one of every three high-school pupils would necessarily be below the median intelligence of his age group.

Educational workers, recognizing that the selective processes now determining high-school attendance do not prevent the admission and retention of many youth whose general mental ability is mediocre, or lower than mediocre, commonly accept assumptions similar to those which have been quoted and conclude that high-school pupils of today are on the average seriously inferior mentally to the group which attended high schools in earlier years. Profound concern about the low level of academic ability believed to be a characteristic of the great mass of high-school pupils has been voiced frequently by speakers on educational questions. An example of the type of statement which has usually gone unquestioned, even though extreme, may be quoted from an address made by Meek at a meeting of the National Education Association in 1929 (29). "Twenty years . . . . have changed completely the job of high-school teachers. Where twenty years ago they instructed only the highest fourteen per cent of the nation's intelligence they must now deal sympathetically and intelligently with all but the lowest twelve per cent of general ability." Many high-school teachers seem to believe that their pupils are inferior to those who came into their classes in earlier years. Frequently the comparison is made by going back to memories of the teacher's own high-school classmates. The elementary schools come in for criticism, on the ground that they promote children year after year, no matter how dull they may be or how little they have learned, thus eventually passing incompetents into the secondary schools. College professors often deplore the decline in the quality of students coming to them from the high schools. There are, altogether, complaints from various quarters regarding the youth who now attend the high schools but "who are really not high-school material."

Various remedies are offered as cures for the alleged degeneracy of the public high school, or as means for checking its downward grade. A solution favored in some quarters involves restrictions on admission to those high schools which are publicly financed. Proposals to limit high-school attendance are often based on the claim that a majority of present-day high-school entrants are "unfit for high school" and that public funds are being wasted to pay the costs of an expensive high-school education for "pupils who can't use it." Tildsley, in the 1936 Inglis Lecture (52), insisted that the majority of high-school pupils had such limited learning capacity that public funds spent on them were wasted. He referred to their "flabby mentality," and advocated the restriction of high-school attendance to a small fraction of youth—a select few having the qualities which he fondly attributed to his own classmates, who were attending secondary school near the beginning of the century. He deplored the influx of pupils of lower and still lower intellectual capacity, and proclaimed that in order to deal with the situation adequately, ... "we must turn back the clock to take some five million boys and girls from the educational dole . . . ." (p. 89).

While the remedy advocated by Tildsley is accepted by only a small minority of educators, there seems to be extensive general agreement with his diagnosis. It is common to find current writers on secondary education who accept unquestioningly the conclusion that the level of academic ability among pupils coming into high school has been progressively deteriorating and that there are now in American secondary schools large numbers of youth whose intelligence is below the levels formerly represented in what is assumed to have been a highly selected clientele. It is frequently held that the high schools' educational program has been "watered down," that the content of high-school subjects has been emasculated, in order to accommodate the unintelligent horde of pupils by whom the high schools have been overrun. Other educational workers who accept the same conclusion regarding the declining ability of the pupil group hold that this decline necessitates changes in the educational program which the high schools have not yet made. Thus we have both those who would restrict high-school attendance to a small select group and those who would modify the school program because they see that it does not now fit the needs of the masses of youth, agreeing in the belief that our high schools now include among their pupil personnel a large proportion of individuals of mediocre and inferior intellectual capacity.

While selection with respect to general intelligence has always been regarded as an important factor in determining the composition of the group attending high school, it must be admitted that little real evidence as to the degree of selection with respect to measured intelligence exists for the period prior to World War I. Soon after the end of the first World War, when group tests of intelligence became available, surveys made by using these tests in high schools furnished data that were generally interpreted as indicating favorable selection with respect to mental test scores. None of these surveys was of such a nature as to afford adequate means of comparing pupils who attended high school at different periods. Instead, conclusions with respect to changes in the quality of the high schools' clientele have generally been in the nature of inferences drawn from data that have only an indirect bearing upon the question of changes that might have been produced by increasing enrollment. These data, which have not been subjected to thorough analysis in previous publications, will be examined in the chapter that follows.

Chapter II

EVIDENCE FROM EARLIER STUDIES OF HIGH-SCHOOL PUPILS

Qualitative changes in the clientele of the secondary schools over a fairly long period can be studied adequately only by overcoming certain serious obstacles that exist because of the very fact that a long period of time is to be covered. This difficulty perhaps constitutes one of the main reasons relatively few research workers have undertaken investigations specifically designed to discover how the level of academic ability to be found in the high schools has been changing as enrollment was extended to include larger and larger proportions of the total population of secondary-school age. While the number of studies that have been designed for the purpose of revealing what changes have occurred in the quality of the high schools' clientele is limited, there have been published many more reports which include certain data pertinent to the question. Most of the existing evidence which has been built up in the literature was accumulated in more or less piecemeal fashion by persons whose primary interests were in other matters and who therefore, in making their observations, neglected some of those precautions which would have allowed more clear-cut conclusions to be drawn concerning this point. Furthermore, not many of the pertinent facts that have been accumulated incidentally have been brought together and analyzed in a manner that makes their meaning for this question apparent. Throughout the writings which deal with secondary education there are frequent references to fragmentary portions of these data, but no comprehensive consideration of them has appeared in professional publications. Even the results of those studies that were made in an effort to obtain an answer to the central question of this monograph have been left almost entirely unnoticed. The most thorough research report of this kind that has been published appeared in a monograph which probably came into the hands of relatively few readers (40). Whether because of this or other reasons, not much attention has been given to its findings. There are a few other reports that grew out of direct inquiries into this question, but in general their conclusions have likewise either been overlooked or treated as though they were of no importance, despite the fact that some of them were based upon comparatively good data. The best of them ordinarily have been ignored in discussions such as those which were mentioned in the foregoing section. Apparently no summary of the results of these few inquiries has been published. Before proceeding to a consideration of the new data that are to be presented, it will be advantageous, therefore, to devote some attention to a survey of these earlier studies.

The mental ability of those pupils who attended high schools when enrollments were very small has in no case been compared in an adequate manner with that of their out-of-school contemporaries. Had direct comparisons been made then by using suitable measures on both those children who were destined to attend high school and those who would terminate their schooling at some point short of the secondary level, the results could have been quite useful now. As it is, little is actually known regarding the intelligence of those youth who came into the high schools during the beginning years of the twentieth century. If they were mentally superior to their age-peers whose formal education terminated more quickly, no conclusive record of this fact has been preserved. Because of the paucity of data that could be used for earlier comparisons of the kind in which we are interested, it is necessary to confine this discussion to studies which date from the period of World War I, when group tests of intelligence were beginning to come into use in the secondary schools. The materials that merit consideration here range through such a variety of forms that it is advantageous to classify them roughly into the following subdivisions:

A. Attempts to compute the amount of change in mental ability that would be produced by a given increase in enrollment, using an estimate of the degree of correlation between mental ability and persistence in school attendance as a basis for determining the extent to which greater proportions of pupils from mentally inferior groups would be retained in school as enrollments increased.

B. Inferences based upon evidence that there had been favorable selection with respect to intelligence at some earlier period, including:

   1. Evidence that the average intelligence quotient among groups of high-school pupils (assumed to be representative of the total group enrolled in high school at the time) exceeded 100 (assumed to be the average for all youth);
   2. Comparisons between scores made on the Army Group Intelligence Examinations by high-school pupils and by soldiers who were tested during World War I (assuming soldiers to be representative of the population in general);
   3. Evidence that children who formerly left the lower grades in school made lower scores on intelligence tests than those who continued in attendance until they reached more advanced grades or high school.

C. Comparisons of mental-test scores collected by testing various high-school groups at different dates.

D. Comparisons of mental-test scores collected by testing comparable groups of pupils attending the same high schools at different dates.

A

As the list that was given above indicates, conclusions regarding changes in the level of mental ability to be found among pupils coming into the high schools have been based upon evidence drawn from studies of several differing types. The work of Thorndike (50), to which reference was previously made, represents the first of these. This method of attacking the problem is wholly dependent upon the assumption of a constant relationship between intelligence and persistence in attendance at school. Thorndike took this correlation as 0.70 and, by obtaining enrollment and census figures from which he could determine the proportion of all youth in high school at various times, showed how the amount of change in intelligence resulting from selection could be computed. While Thorndike himself recognized that there was some doubt as to the accuracy of his assumption concerning the degree of correlation between intelligence ("inborn capacity") and persistence in school attendance, he has been widely quoted by writers who have completely ignored this uncertain matter and who instead treated his estimate as though it amounted to conclusive proof. It is quite improbable that the relationship between intelligence and persistence in school attendance has ever been rectilinear. Beyond this, there is no evidence that this relationship has remained constant over a period of several decades. Instead, there are good reasons for believing that this has been a highly variable matter which depends upon readily changing local and national conditions. Irregularities in employment opportunities open to youth, other economic changes, modifications in school programs and practices, and numerous other cultural shifts almost certainly contribute to variations in the relationship between intelligence and persistence in school attendance. While the extent of the relationship at any particular time has not been carefully determined, the estimate of 0.70, which Thorndike used, is probably not representative of widespread conditions existing at any time. Thus, while his work furnishes a neat illustration of one possible application of the correlation technique, his assumptions are such that his findings should not be regarded as an adequate demonstration that the average quality of high-school pupils has changed by any given amount.

B

The conclusion that the clientele of the secondary schools is deteriorating in intelligence has frequently been reached by a procedure more simple than that which was discussed in the foregoing paragraph. It is common to find writers on secondary education citing data which purport to show that when only two to three million youth attended high school the average intelligence level among high-school pupils surpassed that of the population at large. The means most regularly used to demonstrate the existence of this difference involved only the computation of an average intelligence quotient for a group of high-school pupils and a consideration of the extent to which this average exceeded 100, which was taken as the average for the total population. Then it was argued that since recent enrollments were much larger they included many youth whose intelligence was nearer the average of the entire population and hence lower than that of the former group of pupils. This procedure made a questionable assumption which may have introduced an error that has led to a mistaken conclusion. Without specific evidence, it should not be assumed that the norms for any test are based on a sample that is truly representative of the total population. This assumption has generally been made, without supporting evidence, in all of the studies of the type referred to here. But it has long been known beyond question that the standardization of most group intelligence tests was done on samples that varied enough to create some variation in the norms of the different tests (31). Corrections for this variation are usually necessary before results from different tests can be compared. Crude comparisons of the scores of high-school pupils with a figure assumed for an untested population should therefore be looked upon as furnishing no more than the roughest sort of approximations.

It is true that the results of intelligence tests given to high-school pupils commonly show average intelligence quotients somewhat above 100. Proctor made two early studies which furnished widely quoted data of this kind (36, 37). The first of these studies, made in 1916, showed the median intelligence quotient for ninth-grade pupils in the high school at Palo Alto, California, to be 106. The following year, Proctor tested 955 pupils in five California high schools. From his data the median intelligence quotient for the total group can be computed as 103. Another source of data collected at a very early date is to be found in the records used in connection with the first standardization of the Stanford Revision of the Binet Scale. These records included scores for 50 high-school pupils. After Terman had analyzed these records, he tentatively estimated the average intelligence quotient for high-school pupils in general as "probably not far from 110," (49, pp. 54 and 94).

The public schools at St. Louis were among those to make extensive use of the Terman Group Test of Mental Ability at an early date. A summary of scores made by 6,567 white entrants to St. Louis high schools in 1922 and 1923 was published by Johnson, who found among these ninth-grade pupils a median intelligence quotient of 102.6 (21). A study by Shewman (43) shows that for 259 members of the 1925 graduating class at Grover Cleveland High School in the same city, the median intelligence quotient at the time of their entrance to high school in 1921 was 105.7.

Comprehensive surveys which furnished scores for large numbers of high-school pupils were undertaken in several states soon after group tests of intelligence came into popular use. Among the earliest of these, and perhaps the most widely quoted, is the investigation which Book conducted in Indiana in 1919. This is described in a volume that appeared in 1922 under the title, The Intelligence of High School Seniors (8). The test employed in this survey was of such a nature that the high-school seniors for whom scores were obtained could not be compared readily with the general population, as there were at that time no norms available for it which could have been used appropriately for such a comparison. Book was of the opinion that the seniors on whom he collected scores were in almost all cases drawn from the upper half of the range of human intelligence. The reasons for Book's belief that all except the most unintelligent of his seniors were superior to the average adult do not seem to be apparent in his published data. Odell (33) reported the results of a still more extensive survey, which was conducted in 368 Illinois high schools in 1923. His report summarized data collected from approximately 12,000 high-school seniors, all of whom had been given the Otis Self-Administering Test of Mental Ability. The median intelligence quotient for the entire group was found to be 104. A more recent statewide survey, made with the same test in the high schools of New Hampshire, is quoted in one of the monographs of the National Survey of Secondary Education (26, p. 18). During a four-year period, 1928 to 1931 inclusive, scores were obtained for more than 11,000 seniors. The median intelligence quotient for each of two of these four years was 105; for each of the other two years it was 106.

None of these studies, nor any others of the same type, is entirely suitable for demonstrating how much selection with respect to intelligence was operating to affect the intelligence level of the group coming into the high schools at any period. They are unsuitable because of the uncertain quality of the norms which have been available for use as a basis for comparing the average mental ability of pupils in the schools with that of the total population. Careful students of mental measurement have long recognized the variability in norms from different tests. There are, beyond this, obstacles to be met in an effort to compare scores made on the same test by persons of widely different ages. In view of all this, it must be admitted that the average intelligence quotient of a group of high-school pupils, no matter whether the group is large or small, can hardly be taken as incontrovertible proof that high-school pupils are superior to the general population by any given amount. At the same time, it should be recognized that the weight of whatever evidence has come from those surveys which used intelligence tests among high-school pupils is rather completely on the side of the conclusion that favorable selection has been operating to some extent.

Because of the inadequacies of evidence that can be had from studies of the kinds that have been cited, other facts must be sought if the question of changes in the mental ability of the high-school population is to be clarified. Such other evidence might be sought in those studies of high-school groups which were made by comparing their scores with those made by members of the armed forces. Perhaps the most widely quoted of these studies is that which has been reported by Madsen and Sylvester (28). These writers made use of scores obtained through giving the Army

Group Intelligence Examination, Alpha, to pupils who were attending three high schools during the 1918-19 school year. The average of these pupils' scores surpassed the average made by members of "two typical infantry regiments," for whom scores on the same test were available. Madsen and Sylvester assumed that the Army in general represented an intellectually superior section of the adult male population, that the two infantry regiments with which they made their comparison were typical of the Army, and that therefore "the [1919] students are a very highly selected group mentally."

The work to which Thorndike and his assistants refer in The Psychology of Algebra is similar in certain respects to that of Madsen and Sylvester. Scores on Army Alpha were collected for more than 5,000 high-school pupils in four Midwestern states. After comparing the scores of these pupils with the scores made by army recruits, these investigators wrote, "It will be seen that in spite of the wide range of ability in pupils, of which every high school teacher must be conscious, there are nevertheless few (less than 3 per cent) who have not median intelligence or better. This corresponds approximately to a mental age of thirteen years and two months on the Stanford Binet Scale. The pupils in academic high schools are in fact a limited group which covers just about half, the upper half, of the total distribution of American intelligence," (51, p. 24). The Army data which were accumulated in 1917-18 were long regarded as furnishing the best available measure of the level of mental ability of the unselected adult male population of the United States. These data are, nevertheless, poorly suited for use as a criterion against which to measure the degree of selection among pupils attending high school. Beyond any uncertainty which there may be as to how nearly the Army cases were truly representative of the adult male population in general, it should be noted that sectional variability in the Army scores is significantly large. Because of this, comparisons between Army scores and scores made by local groups of pupils for the purposes being considered here should take these variations into account. This seems not to have been done in the studies mentioned above. Another difficulty arises because of the age differences between soldiers and high-school pupils. Jones and Conrad (25) have shown that the scores of males tested with Army Alpha increase with age up to the eighteenth year. Most of the high-school pupils who were subjects of study were tested at ages lower than this. There are additional reasons why scores obtained by testing in public schools and in the Army during World War I cannot properly be regarded as comparable for the purposes being considered here. Ordinarily paper-and-pencil group tests of intelligence are not equally suited for use with persons whose school experience differs greatly. Scores by persons long out of school and without much recent experience in situations that require extensive use of reading and writing can hardly be compared with those of pupils who give their attention regularly to this kind of work. Because of all these difficulties, such comparisons are much less enlightening than a comparison of the scores made by two groups of children, one group representing those who will leave school at the elementary level, the other representing those who will continue into high school, and both tested before differences in school experience began to operate. It is now impossible to collect data of the kind necessary for making a direct comparison of the measured mental ability of early high-school pupils and their contemporaries who did not attend high school. Such studies of elimination as were made prior to the advent of mental testing are of very little value in this connection. More recently, since mental tests came into common use in the schools, some records that may be employed in making such comparisons have been accumulated. Studies of continuation-school pupils afford one good source of data that have been used for comparisons of this kind. An early example is to be found in the work of Counts (10). Using the results of intelligence tests that were given in the schools of Bridgeport, Connecticut, in 1920, he compared pupils who were attending a trade school, an evening high school, and a continuation school with pupils in the conventional high school. All three of the groups that were made up of persons who had dropped out of the conventional-school program showed lower test scores, on the average, than those who persisted in high-school attendance. Furthermore, the average score for the pupils in continuation school was lower than that of any of the other three groups. Counts made these comparisons in a manner that shows quite clearly both the difference in group medians and the wide overlapping between groups. Beyond this, he pointed with some emphasis to the wide range of scores within each group, and summarized his observations in this point by writing, "Thus, while we may say that the high-school population represents a certain measure of psychological selection, it is clear that this principle does not operate conclusively in a negative fashion and much less in a positive way in determining attendance at high school. Neither are all of meager intellectual endowment barred from high school, nor are all possessing superior talent to be found within its doors," (p. 127). This well-founded view appears to have made relatively little impression, as those who have quoted the Counts study have commonly referred only to the lower average which characterized the continuation-school group. Some three years later, Reedy (38) reported testing pupils who attended a continuation school in Reading, Pennsylvania. Her results, obtained by using Haggerty Intelligence Examination, Delta 2, showed median intelligence quotients of 91 for boys and 88 for girls. She made no comparisons with scores for students attending high school in the same community, but the fact that these medians are markedly lower than those usually found in high-school groups suggests the possibility that adverse selection was responsible. A number of other similar groups were subjected to mental testing during the period when continuation-school programs were expanding. In general, intelligence quotients considerably below 100 were observed among continuation-school pupils, and it was commonly assumed that adverse selection was operating. A careful study which included direct

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comparisons between pupils in continuation schools and in full-time schools in the same communities was reported by Hopkins in 1924 (20). He found the average intelligence quotient of 14- and 15-year-old children who attended continuation schools to be 85 and 87, respectively. This was 17 points lower than the comparable figures for children of the same ages who attended full-time schools in the communities in which he obtained his continuation-school cases. Like Counts, Hopkins showed clearly that the scores of the two groups of pupils overlapped to a great extent. In commenting on this, Hopkins has written, "There were pupils in regular school who scored as low as those in continuation school, but not as many. . . . . There were a few pupils in continuation school who scored as high as the best of the regular school group," (p. 119). All of these studies lend some support to the view that pupils who persisted in school were, on the average, superior in mental ability to those who left under conditions that necessitated their enrollment in continuation classes. They are, however, in no sense proof that all high-school pupils of the period were superior or that only inferior intelligence was to be found among those children whose regular schooling was terminated before they fulfilled the requirements of the compulsory attendance laws. The very simple presentation of data on this point by Counts is, in fact, incontrovertible evidence to the contrary. Likewise, the work of Hopkins shows beyond question that in every continuation school which he studied there were pupils whose intelligence test scores were high enough to place them among the superior portion of their own age group in the regular schools of the same community. In the light of this evidence, we might expect that an increase in high-school enrollment, with the increment drawn at random from a group similar to that which was formerly eliminated, would bring into the high schools pupils from a wide range of mental ability. If the ability measured by mental tests were constant in the total population, some of these new pupils would be superior to the average among their predecessors, but the majority would be below this average, and the general trend for the total high-school group would be downward.

Another means for discovering the extent of selection that goes on with elimination has been used in studies of the educational histories of children to whom intelligence tests were given while they were attending elementary school. An example of this approach is to be seen in the work which Woody and Cushman did in the Denver public schools (59). They reported results based upon a compilation of the school records of 1,424 children for whom intelligence quotients had been recorded when they were attending the sixth grade in 1928. These investigators compared the average intelligence quotient of 696 pupils who graduated from high school within six years after completing the sixth grade with that of the remaining 728, only 96 of whom were attending Denver schools in 1934. There was a difference of 10, favoring the high-school graduates, between the averages of the intelligence quotients of the two groups. Had those 96 pupils who persisted, even though they had not met graduation requirements on schedule, been properly classified eventually, the difference between the graduates and nongraduates quite possibly would have been shown to be slightly smaller. Data from St. Louis, reported by Johnson (22), are consistent with Woody and Cushman's findings. Johnson's data were obtained through testing the ninth-grade pupils of the five St. Louis high schools which admitted white children. The observations which he reported were based upon the records of 1,755 pupils who graduated within four years after entering high school and of 1,911 others who were recorded as having withdrawn from school without having met graduation requirements by the time four years had elapsed. The average intelligence quotient for the graduates exceeded that of the withdrawing group by 10. All of those students who persisted in school but who had not met graduation requirements within four years were ignored in Johnson's computations. As in the case of the Woody and Cushman study, this omission probably exaggerated the true difference between graduates and those eliminated prior to graduation. Benson (6) conducted a similar but more thorough study in Minneapolis. Her work covered a period of such length that school attendance records for virtually all of her subjects had been completed before her data were assembled. She began with 1,989 pupils to whom a group mental test had been given in 1923, when they were enrolled in grade 6A. Seventeen years later she was able to collect data showing the amount of formal schooling completed by each of 1,680 of the original group. Of these, 270, or 16 per cent, had not entered high school; 590, or 35 per cent, had entered high school but had withdrawn or been eliminated prior to graduation; 820, or 49 per cent, had eventually been awarded high-school diplomas. She found among those who did not enter high school a median intelligence quotient of 95 (Terman equivalent, based upon scores from Haggerty Delta 2); for those who embarked upon but did not complete the high-school course she observed a median intelligence quotient of 105; for those of her subjects who met high-school graduation requirements her data showed the comparable figure to be 117. While the overlapping of these groups was, of course, extensive, it is clearly evident that selection with respect to mental ability had been very effective to produce such wide differences in medians as they exhibit. It should be noted that the median intelligence quotient of these high-school graduates is substantially above the central tendency commonly found by testing other groups made up of high-school seniors.[1] Whatever may be the cause of this discrepancy, the situation in which these data were obtained was sharply influenced by certain factors that produced selective elimination.[2]

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[1] Fairly typical figures for seniors seem to be 10 or more points lower. (See Table 1.) The median value of 105, which Miss Benson reported for the group which withdrew from high school, comes nearer the level often found by other investigators who have worked with high-school seniors.

There have been numerous other studies of elimination, conducted under a variety of conditions in various parts of the country (13, 14, 34, 53). It may be said that these studies, which have been appearing for almost three decades, have ordinarily found elimination or withdrawal from school to be negatively related to mental ability. Thus they lend a degree of support to the view that increasing enrollments have been brought into the high schools by drawing upon a group of youth who were, on the average, of lower mental ability than those who formerly attended. One of the common faults of most elimination studies, so far as their significance for the present inquiry is concerned, is their tendency to focus attention upon differences in central tendency and at the same time to treat lightly or ignore the overlapping of groups that are being compared. This error is so frequent that it accounts for many of the false notions which exist regarding individual differences and which result in a great number of indefensible educational and social practices. Even in certain cases in which an author has presented the facts with respect to overlapping distributions in the clearest manner and has laid particular stress on their meaning, readers are prone to treat differences between averages as differences that hold for all members of the groups that are being compared. As a result, a misleading generalization about the inferiority of all pupils who drop out of school early persists in the face of positive evidence to the contrary.

There are difficulties to be overcome in studying the selective influences operating to determine the nature of the high-school population at any period. Despite these difficulties, many of which have not been met effectively by the methods employed in most of the studies to which reference has been made thus far, these studies show a degree of consistency in their findings, appearing to agree in the main with the conclusion that the high schools formerly enrolled and retained pupils who were drawn in disproportionately large numbers from the mentally superior sections of the total youth population. There is in these studies, however, little basis for determining with accuracy the amount of favorable selection that operated generally during the period with which this study deals. Indeed, they furnish almost no evidence to show how the forces that affect selection with respect to mental ability have fluctuated throughout the years, and the task of measuring the shifting influence of these forces remains to be accomplished.

When questions about the changing quality of the high schools' clientele are discussed, whatever evidence is offered to support the argument that there has been a decrease in the average academic ability of high-school pupils usually comes from the kind of materials that have been reviewed in the preceding pages. The apparent consistency of the results from the majority of these studies has no doubt caused many educators to accept them as sufficient proof of the existence of conditions which, it is assumed, would necessarily bring about less favorable selection as enrollments increased. There has been little tendency to look for inadequacies that might be common to all of these studies, and almost no attempt has been made to discover what questionable assumptions may be running through the conclusions that have been based upon them. It should be recognized that facts regarding the degree of selection existing at any one period cannot serve as proof that an increase in enrollment would necessarily change the quality of the pupil personnel. At best, the studies that have been discussed here afford no more than an indirect approach to the question of changes in the quality of pupils coming into high school. Little of their data was collected for the purpose of finding how the high schools' clientele has changed. Writers who made use of these data frequently attached unwarranted meanings to them, while at the same time they overlooked certain pertinent facts, such as those emphasized by Counts. Certainly, there is in all of the foregoing no conclusive proof that the academic ability of the group with which the high schools deal has either declined or become more variable as enrollments grew larger.

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[2] Benson's data are of special significance because of their relation to the work of Rundquist (41), which is discussed on pages 36 and 37. While detailed information is not at hand, it is apparent that a large proportion of her 820 graduates were among the seniors of the 1929 class whom Rundquist found inferior to another group of seniors who graduated from the same schools in 1933.

C

The plausibility of the argument which holds that increases in high-school enrollment have been drawn from successively lower and lower strata of the population may be responsible for the fact that available data pertinent to the question have not been subjected to the most careful analysis. Re-examination of statistical materials from some of the more extensive investigations that were quoted above, and from other sources that afford additional similar data, will be useful in evaluating the inference that the mental level of successive classes coming into the high schools has been inferior to that which existed among their predecessors. A very simple means of studying changes in the mental level of high-school pupils will be employed at this point. It consists of nothing more than the rough comparison of the ability of various groups of pupils tested at different times throughout the period during which group tests of intelligence have been in use in secondary schools. This comparison can be made by arranging in chronological order the averages taken from the publications of the several investigators who have reported intelligence quotients for large groups of high-school pupils who have been the subjects of their research. If test scores collected under comparable conditions show that those pupils who have attended school more recently have been, on the average, inferior to those who were enrolled in earlier classes, this difference would afford strong support for the argument that the quality of pupils coming into the high schools has been declining. If, on the other hand, no such difference favoring the earlier groups is revealed by extensive comparisons of this kind, there is sufficient reason to question the belief that the high schools' clientele has deteriorated in the ability measured by mental tests.

A very large mass of data that can be used in chronological comparisons was obtained by surveying publications which have appeared since group tests of intelligence were introduced into the secondary schools. These data cover a period of more than twenty-five years. At the outset, certain standards were established as guides for determining what data would be employed in these comparisons. The use of these criteria led to the selection of data that met the following conditions:

1. All of the records that were used came from the administration of group intelligence tests to pupils who were attending public high schools. (Proctor used Binet IQ's in 1916.)[3]
2. No records were accepted in those instances in which any evidence suggested that a bias had entered into the selection of a sample to be tested within a school (or class), thus possibly causing only a peculiar portion of the entire group to be tested. This resulted in the rejection of data that came from testing such special groups as honor society members, extracurricular leaders, athletes, accelerated pupils, retarded pupils, failing pupils, pupils in a single curriculum, pupils planning to enter college, or other special groups that were probably not representative of the total pupil population from which they were drawn.
3. Records on large groups of pupils were sought. The minimum number of cases on which to base an average figure was set at 500. This was maintained except in three instances in which some unusual circumstance made the records from a smaller group especially valuable.[3] While the practice of requiring groups as large as this may seem to put a premium upon records collected in large school systems and therefore in urban rather than rural areas, many of the useful sources proved to be reports of surveys that combined records which came from numerous schools covering a wide range of communities.
4. The results of intelligence tests were used only if they had been reported in the form of intelligence quotients for which a measure of central tendency was given or could be computed.

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[3] Proctor's early study (36) has been included because it appears to be the first report of its kind. Shewman's article (43), which gives scores from Cleveland High School in St. Louis, is of particular value because of its relation to the report by Johnson (22), which gives data that were collected several years later in the same high school.

No attempt was made to estimate approximate intelligence quotients from scores reported in other forms, such as percentile ranks or central tendencies of distributions of raw scores or mental ages.

5. No test scores were used unless the test from which they were derived was identified and the approximate date of the testing could be determined.

Averages of intelligence quotients from all of the data found to meet these requirements have been assembled in Table I.

There are a number of limitations which should be taken into account in considering the materials that have been tabulated here. First of all, averages based upon scores from different tests entered into these tabulations. Direct comparisons between scores from different tests involve the possibility of errors that might arise because of differences in test norms when standardization has not been uniform. It is apparent that there has been little systematic shift from the use of one test to the use of a different one as time passed. It is also known that norms for the tests that have been used most extensively here are not excessively variable. Among the tests that are represented in this table, the two whose norms deviate most from those of the Terman test are the Haggerty Delta 2 and the Miller Mental Ability Test. In the case of each of these, the results have been converted into the equivalent of Terman intelligence quotients (16). In order to overcome the influence of any errors that might arise through the variation in norms, the results of a single test can be segregated, thus eliminating any possible misleading effects of comparisons that ignore this variation. When this is done for the averages derived from Terman scores, the results show a slight tendency toward higher values for the more recent observations (see Fig. 3). Segregation of those averages that are based upon Otis Self-Administering Examination scores reveals no appreciable tendency toward either gain or loss throughout the period for which these scores are available (Fig. 4). From all of the evidence at hand, it would appear that lack of perfectly comparable norms has neither concealed any very significant trends nor distorted the picture to a serious extent in any other manner.

Another difficulty grows out of the fact that pupils of differing grade and age levels are represented in the various samples. Again two subgroups, in this instance homogeneous as to school grade, were segregated. The accompanying figures show the IQ averages for freshmen and for seniors, the only two classes of pupils with which much data could be identified (Figs. 5 and 6). They show no very pronounced upward or downward trends, though there is apparent among the more recent groups of seniors some indication that the reported average intelligence quotients may be shifting upward to a slight extent.

It may also be noted that the reports from which these averages were taken are not entirely uniform with respect to the statistical treatment

TABLE I

TRENDS IN INTELLIGENCE QUOTIENTS, 1916-1942

Location	Source of Data	Date	Test	No. of Cases	Av. IQ
	1. Freshmen (Grade IX)				
1. Palo Alto, Calif......	Proctor (36)	1916	Stanford Binet	107	106
2. St. Louis............	Johnson (21)	1922-23	Terman	6,567	103
3. New York City........	Symonds (48)	1928	Terman	1,594	105
4. Tulsa................	Portenier (35)	1931	Otis S.-A.	1,164	107
5. St. Louis............	Johnson (22)	1931	Terman	3,672	104
6. Minnesota............	Minn. Council School Executives (32)	1935	Kuhlmann-Anderson	4,192	105
	2. Intermediate, Mixed, or Grade Not Designated				
7. California...........	Proctor (37)	1917	Army Alpha	955	103
8. New York State.......	Haggerty, Nash (19)	1922	Delta 2 (Terman equivalent)	1,433	106
9. Kansas...............	Clark, Gist (9)	1922-23	Terman	2,423	96
10. Massachusetts........	Dearborn (12)	1924 or earlier	Dearborn	885	107
11. St. Louis suburbs....	Aldrich (1)	1927 or earlier	Otis S.-A.	1,043	107
12. Cheltenham, Pa.......	Wessel (55)	1927	Terman	534	108

13. Sioux City, Iowa.....	Steckel (45)	1927	Otis S.-A.	2,134	105
14. Oakland, Calif.......	Portenier (35)	1926-29	Terman	11,013	101
15. Reading, Pa..........	Nat. Survey Sec. Education (26)	1929	Terman	1,454	103
16. Oakland, Calif.......	Rutledge, Fowler (42)	1930	Terman	5,626	102
17. Widely varied........	Nat. Survey Sec. Education (26)	1932	Otis, Pressey	9,120	102
18. Middlewest...........	Witty (58)	1934	Terman, Otis	27,642	104
19. St. Louis............	Johnson (23)	1936	Terman	14,000	107
20. Everett, Wash........	Blair (7)	1937	Otis S.-A.	1,463	104
21. Middlewest...........	Finch*	1942	Miller (Terman equivalent)	1,410	109
	3. Seniors or Graduates				
22. Illinois.............	Odell (33)	1923	Otis S.-A.	12,000	104
23. St. Louis, Cleveland High School...	Shewman (43)	1925	Terman	259	106
24. Lincoln, Neb.........	Portenier (35)	1926-30	Terman	2,380	109
25. New Hampshire........	Nat. Survey Sec. Education (26)	1928-31	Otis S.-A.	11,000	105-106
26. Widely varied........	Nat. Survey Sec. Education (26)	1932	Otis, Pressey	2,054	105
27. St. Louis, Cleveland High School...	Johnson (22)	1935	Terman	409	109
28. Middlewest...........	Ames (2)	1939-41	Otis S.-A.	814	105
29. Tulsa................	Reynolds (39)	1940	Terman, Otis	888	110
30. Indianapolis.........	Harshman (60)	1941	Otis Higher	2,713	107

*Unpublished data which will be discussed in chapter iii.

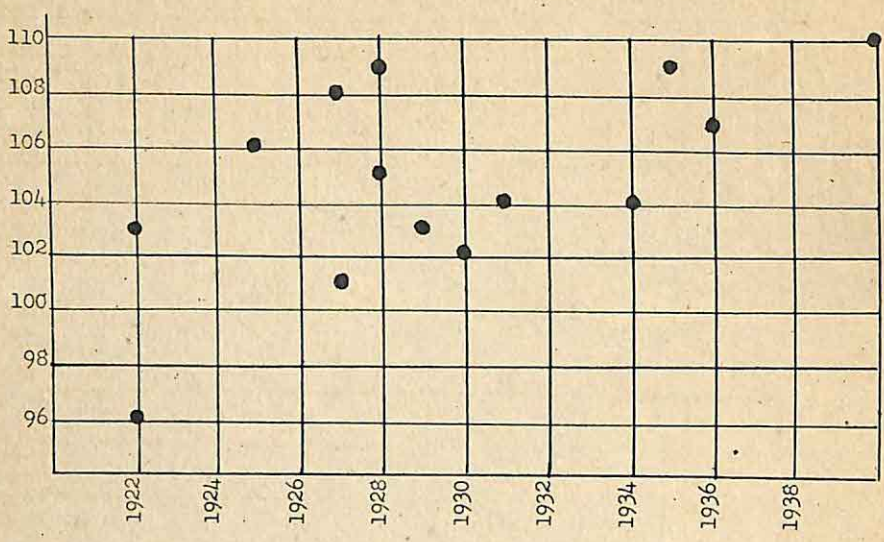

Fig. 3.—I.Q. averages, based on Terman test

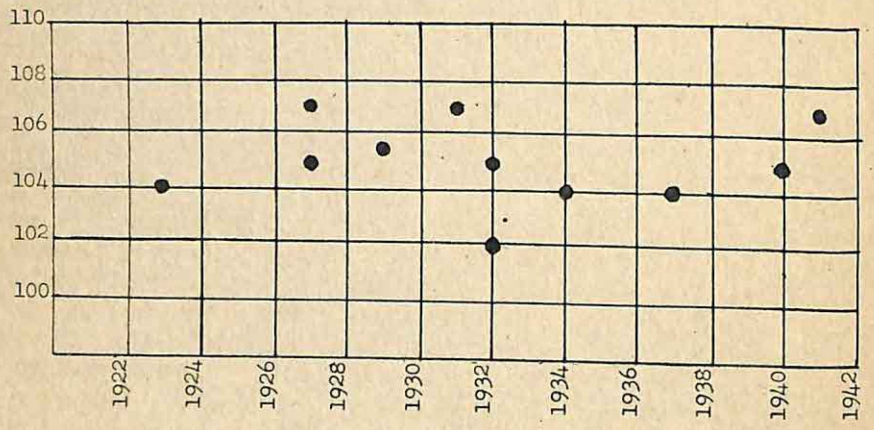

Fig. 4.—I.Q. averages, based on Otis test

they have employed. The averages recorded here were not all computed in identical manner; instead, there was variation in practice at this point, as certain authors reported medians while others reported means. Whatever measures of central tendency investigators recorded in their original reports were used as reported. When no measure of central tendency was given, a median was computed, if there were available data from which this could be done. When no median could be found, the arithmetic

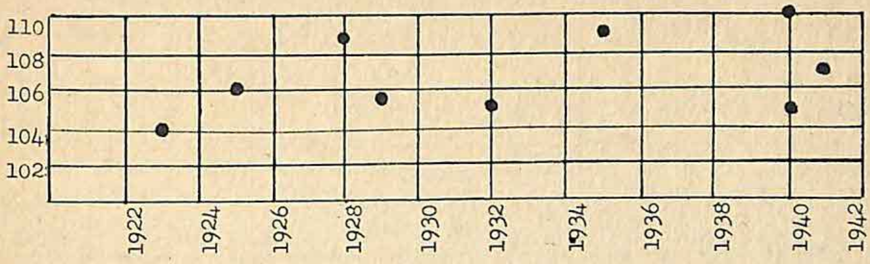

Fig. 5.—I.Q. averages, seniors

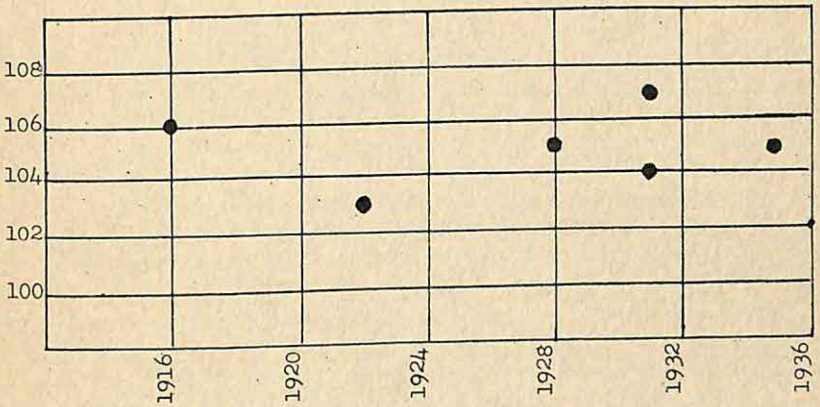

Fig. 6.—I.Q. averages, freshmen

mean, if it could be obtained, was taken instead as the measure of central tendency. In certain instances it was possible to do so by combining means from two or more subgroups for which means had been reported but for which there were given insufficient facts to permit the computation of a median. There was one case in which the most useful data to be had consisted of median intelligence quotients for four rather large subgroups; in this instance, the weighted arithmetic mean of these four medians was taken. Throughout almost the entire series of intelligence test results that have been assembled here, the observed central tendencies were based upon quite large samples. In view of the fact that distributions of intelligence quotients such as those with which we are dealing seldom show much skewness, there is, therefore, very slight danger of creating serious errors through the combined use of these two measures of central tendency in comparisons of the sort that are represented here.

While the data that have been tabulated came from studies that have used different tests and despite the fact that there has been some variation in the methods used by different investigators to obtain measures of central tendency, it appears that the comparisons required for the purposes of this study suffer little from these sources. Of greater consequence is the lack of complete information regarding many possible selective factors not reported in the publications from which the data were assembled. Even though these data are in the aggregate very extensive (the total number of cases represented is approximately 130,000 and exceeds by far all of those that have been used in any previous study of this question), it is possible that some unrecognized selective factors may tend to vitiate the results. There has been presented here all of the data on large groups of pupils in public high schools which could be found in usable form, except those coming from samples that were apparently unrepresentative. The arbitrary rejection of scores from groups numbering less than 500 cases, except in a few instances in which some special feature gave reason for the inclusion of records from smaller groups, reduced the total number of localities represented. It should be noted, however, that, except for the deep South, almost all sections of the country are included and that most of those sections which furnished scores for the earlier studies are also to be found listed at the later dates. Taken altogether, these data give a far more comprehensive view of the average intelligence quotients of high-school pupils throughout the years than has been presented in any previous publication. The absence of any marked systematic trend toward a lower average value during the period of twenty-six years which is covered by the foregoing tabulations is readily apparent and may be seen by inspection of Figure 7. In so far as the published results of psychological tests afford evidence as to the level of academic ability to be found among high-school pupils between 1916 and 1942, it appears from this summary that there has been no decline in the average level of academic ability represented in the high schools throughout that period. While fragments of these records frequently have been cited as evidence that a decrease in academic ability in the high schools

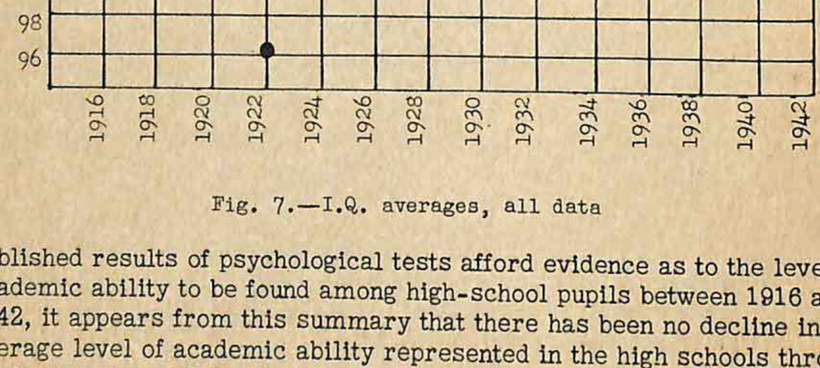

Fig. 7.—I.Q. averages, all data

has occurred, no more than a small portion of them have ever been brought together previously. Examination of them in their entirety shows quite clearly that they lend no support whatever to such a conclusion. Instead, there is some slight tendency toward a higher level during the more recent years, as the lowest averages appeared in most instances prior to 1930.

There exist in the publications of other investigators who have used intelligence tests in studies of high-school pupils certain additional data which, even though they have not been reported in a form that makes it feasible to include them in the tabulations that have been given, have some bearing on the question of changes in the measured mental ability of the high schools' clientele. Among these is a comprehensive bulletin by Coxe (11), who, in 1932, summarized the results he obtained by collecting intelligence test records from which there were computed the mental ages of some 10,000 pupils who attended high schools in 58 different communities in the state of New York. His findings are consistent with the facts that were presented above. Having compared his records with the results of certain earlier surveys which used intelligence tests among high-school pupils, Coxe concluded that the median mental ages of pupils attending these New York high schools "agree with the medians of the country as a whole taken ten years ago" (p. 17).

Miss Portenier, in connection with her doctoral dissertation (35), attempted to find evidence to show the extent to which pupils of low mentality were coming into high schools. After surveying the literature that appeared prior to 1933, she concluded that published materials furnished too little data to be of much usefulness. She then resorted to letters of inquiry directed "to twenty-five representative high schools distributed in all sections of the country. . . . . Replies were received to most of the letters, but the information was very disappointing. Of all the schools investigated, only one had a uniform testing program and was keeping a cumulative record of the testing, extending back over a ten-year period," (p. 13). Altogether, she was able to find in eight cities data of which she made some use. As a result of this phase of her work, she came to the tentative conclusion that there was "a clear tendency toward a lowering of the mean mental and chronological ages of pupils entering high school." At the same time she was forced to admit that "the mean intelligence quotient has not shown a marked decrease . . . . ," (p. 39).

The National Survey of Secondary Education included as part of the study of the secondary-school population an attempt to assess changes in the mental ability of pupils in the high schools (26). This was done by comparing the median intelligence quotient for 9,120 pupils tested in 1932 by the survey staff with medians found in five other studies that had been made at earlier dates. The data used for this comparison unfortunately included records on only 238 pupils who had been tested prior to 1929 (p. 23). The authors were of the opinion that their evidence seemed to indicate a trend ". . . . toward increased representation in secondary schools of intellectually less competent youth. It is not that intellectual selection is no longer operative, but that it is less operative than formerly," (p. 28). The authors recognized that they did not have data sufficient to justify any very positive conclusion as to what decline in mental ability, if any, had accompanied increasing enrollments. Other writers who have taken the National Survey findings as proof of a decline in the mental ability of pupils attending high school have obviously not examined the data assembled in this Survey report with much care. The method which the Survey staff used at this point represents an improvement over the methods that generally had been followed prior to that date, but data far more extensive than those which were collected for the National Survey are necessary to provide conclusive results.

Three of the studies mentioned above (those by Coxe, Portenier, and the staff of the National Survey of Secondary Education) have made some use of direct comparisons between mental test scores of pupils who were in high school at different times. Coxe found no evidence indicating that earlier pupils surpassed those who came into high school more recently. Miss Portenier, whose work was begun as a study of pupils of low mentality and who assumed that such pupils were brought into the high schools in unduly large proportions as enrollments increased, found little to support this assumption. The National Survey staff saw some suggestion of a downward trend, but its comparisons were based upon such limited data that no more than a highly tentative conclusion was possible at that time. Now, in view of the very much more extensive series of test results that has been brought together in the foregoing pages, it seems reasonably certain that the inconsistent results of earlier comparative studies may properly be attributed to inadequate data or to a tendency to give undue weight to unimportant differences. If the facts that have been presented in this section were the only evidence to be considered, it would be necessary to conclude that during the period since group intelligence tests came into use the average measured mental ability of pupils in the high schools has shown but little change and that there is some basis for suggesting that any change which has occurred has been upward rather than downward.

D

The most direct means of measuring changes in mental ability among pupils in high school over a period of years requires comparisons of data on the mental ability of pupils enrolled at different periods. The records which were assembled in the foregoing section apparently provide the first extensive comparisons of this kind. The comparisons which can be made with these data furnish a much more nearly definitive answer to our central question than can be had from the more roundabout approaches to it that have been reviewed. If testing is adequately done under comparable conditions in the earlier and later groups and if the groups tested are representative samples of the total high-school enrollment of the respective dates involved, any changes in the ability that is measured will be revealed by comparison. It is difficult to determine the extent to which the conditions necessary for comparisons that are free from error have been met when data are assembled from such a variety of sources as entered into Table I. Consequently, comparisons between mental test results obtained through testing pupils attending the same schools at different times are of particular value. Comparisons between present and former pupils in any school are possible only if there have been preserved from the records of former pupils measures of mental ability that were taken by standardized procedures when those pupils were of school age. If such records can be found, comparable current data can be collected through studies made among youth now attending high school. The results of a few investigations of this kind, designed to provide direct comparisons between present and former high-school pupils, have been published within the past ten years. It is true that these investigations have been limited in scope and that some of their possible sources of error may not have been recognized. While they do not furnish indisputable evidence as to how much present-day high-school pupils differ in measured mental ability from their predecessors, their significance is nevertheless sufficient to require that they be taken into account whenever this question is considered. Thus far their results have not been brought together, and their findings have been ignored for the most part by educational writers, who have instead accepted Thorndike's estimates, or similar materials, as adequate evidence that the level of mental ability existing in the high schools is lower than it was in former years.

Perhaps the most nearly conclusive study of changes in the measured mental level of high-school pupils is to be found in the work of Roessel (40). He tested all pupils in grades seven to twelve, inclusive, in three high schools fourteen years after the pupils of these same schools had first been subjected to a group mental test. There were 1,100 cases for which he had records from the first testing in 1920; by 1934 the number that could be tested had increased almost 79 per cent, so that the total number of cases at that time was 1,966. When the median intelligence test scores of the pupils enrolled in 1934 were compared with the medians for their predecessors, the more recent pupils were found to be superior. This superiority held for the pupils in each of the four high-school classes. Furthermore, the members of the 1934 group had progressed through school more rapidly, as they were on the average three months younger than the pupils of 1920. It is entirely clear from Roessel's work that there had been a gain in the average mental test score of high-school pupils in the three communities from which he gathered his data. Furthermore, he presents facts indicating that high-school enrollments in each of these three communities had increased much more than the total population of these communities had grown. It is therefore certain that the gain in the average level of mental test scores which he observed cannot be attributed to a more rigorous process of selection that had developed in such a way as to restrict enrollment. There can be no doubt that, in those communities which Roessel studied, increasing enrollments were accompanied by an increase in the average level of measured mental ability of pupils coming into the high schools. Unfortunately, Roessel was not able to inquire into the influence of certain factors, even though he was aware of the possibility that they might have contributed to the increases in mental test scores which he observed. One of these factors, though not necessarily the most important, is selective migration. Roessel reported no data that shed any light upon possible changes which population movements might have produced in his communities. The best currently available evidence regarding the general selective effects of migration indicates that its influence, so far as intelligence levels are concerned, is ordinarily far less than some sociologists had formerly believed (44). Even so, its possible effect in a particular locality should not be ignored in a study of this kind. Bilingualism in the home, another factor on which Roessel collected no data, might possibly have influenced his findings. Census data show that all of the communities which he studied had substantial minority groups of foreign-speaking people and that the proportion of the total population made up of foreign-born was gradually decreasing during the interval which was covered by his study. These limitations are not to be viewed as affording a basis for rejecting Roessel's findings as they apply to the particular communities which he studied. They do, on the other hand, reduce the general significance that can be attached to his work, unless his results are corroborated by studies made in other localities.

Rundquist (41) has published an article that supports to some degree the work of Roessel. Rundquist's data, which were collected in the public high schools of Minneapolis, furnish a comparison of high-school graduates of the classes of 1929 and 1933. A form of the Minnesota College Aptitude Test, which consists of vocabulary-recognition items, was given to the senior classes of nine high schools in each of these two years. Two small vocational schools, both of which were growing in prestige and gaining in enrollment during the period in question, were excluded from the study. Practically all of the seniors (88 to 99 per cent) enrolled in six of the nine high schools were tested; in the other three high schools, where it was announced that the tests were for seniors who expected to enter college, scores were obtained for only those seniors who elected to take the tests. The same procedure was followed in both 1929 and 1933. Rundquist found that the scores of the 1933 graduates were significantly higher than the scores made by those who had finished their high-school careers four years earlier. This difference, favoring the more recent graduates, appeared in eight of the nine schools. While Rundquist's report does not show exactly how much the enrollment in these high schools had increased in the interval, the number of graduates for whom he obtained records went up from 1,559 to 1,968 during the period covered by his study. This was a gain of more than 25 per cent. Furthermore, it is known from other sources that the high schools of this city were gaining enrollment very rapidly during the period with which Rundquist was concerned and that this gain was greatly accelerated during the early years of the depression in those schools which served the working-class sections of the city. The population of the city was not making parallel gains during this period. Increases in enrollment were instead due mainly to the retention of a larger percentage of all the youth of the city in the high schools. Rundquist's data were segregated by sex. This makes it possible to observe that the gain in the number of graduates was not equally distributed between the sexes, but that the size of the group of boys tested increased by more than 30 per cent, while the corresponding increase for girls was approximately 22 per cent. Paralleling this, the gain in median College Aptitude Test score for boys was appreciably larger than the gain in median score for girls. Finally, the distributions of scores show that there was no greater variability in scores among the more recent graduates, thus making it evident that increasing enrollment had not brought into the group any significant number of graduates who made excessively low scores.

Additional evidence accumulated through a recent survey of the senior classes of Indianapolis high schools is consistent with the observations that have been reported by Roessel and by Rundquist. The Indiana state survey of high-school seniors, which was conducted under the direction of Book (8), furnished mental test scores on 6,188 persons, or approximately 55 per cent of all seniors in high schools of that state in May 1919. Twenty-two years later, in May 1941, the same test was administered to all of those seniors who were present in Indianapolis high schools on a given day. The median raw score for members of the 1941 class in Indianapolis is shown to exceed that for the statewide group of 1919 by 15. The semi-interquartile range of raw scores on this test was 12 in 1919 and 9 in 1941. A brief published report of this comparison says, "In the 1941 survey more than 80 per cent of the pupils in the senior class of the Indianapolis public high schools made a score which was higher than the median score made by the members of the 1919 senior class of Indiana. The average age of the 1941 group was slightly less than that of the 1919 class. Data available for the group of Indianapolis high school seniors in the 1919 survey, when compared with the 1941 group, does not make the comparison less favorable to the 1941 class," (60). During the period between the two surveys, the size of the senior class in the Indianapolis high schools had more than doubled.[4] This gain was some five times as great as the increase in the size of the youth population from which these high schools drew their students. It is therefore apparent that a large increase in the proportion of youth retained to the high-school senior level in Indianapolis was accompanied by improvement rather than deterioration in the quality of personnel in the senior class.

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[4] Mr. H. L. Harshman, Director of Research, Indianapolis Public Schools, has kindly furnished me with this fact and certain other details of the Indianapolis survey not given in the brief published article to which reference is made.

Another study which makes a direct comparison of the mental test scores of pupils enrolled in the same high schools at different periods is to be found in the work of Havrah Bell (3). The comparisons which Miss Bell made were based upon data from four California localities. She reported that the median intelligence quotient for some 2,700 pupils attending the high schools of these localities in 1933-34 was slightly lower than that which had been observed in the same schools in 1917-18 by Proctor (37). The published report, based upon her Master's thesis places the median intelligence quotient for the earlier pupils at 108 and that for the more recent group at 104 (4). Figures in her original report show these values instead to be 107.5 and 104.9 respectively, so that the difference between the median intelligence quotients of her two groups appears to be 2.6. When data from each of the four high schools which she studied are considered separately, it is found that there is a slight gain in median intelligence quotient for pupils in the largest of the schools and decreases of varying magnitude in the medians for pupils of each of the other three. Details necessary for adequate evaluation of this investigation are not shown in either of the two reports. No information is given as to whether the same tests were used on both occasions. It appears that the 1934 data were tabulated from whatever test scores could be found in the files of the several schools. Likewise omitted is any reference to the possible effect of bilingualism, despite the fact that the United States Census shows that there had been an extensive movement of persons of Italian birth into one of the districts during the interval. Altogether, even though population changes in the communities had been relatively large, their possible effects have been neglected. In addition to whatever other inadequacies this study may possess, it is filled with numerous obvious internal inconsistencies which reveal such careless treatment of the data that one may properly be somewhat skeptical regarding the validity of the reported findings.[5] As far as can be determined through an examination of published studies, it seems that Bell's results are the only ones that disagree with the findings of those other investigators who have made direct comparisons between the mental test scores of two groups of pupils who attended the same secondary school at different periods. Since it is known that there is quite wide variation between the levels of measured mental ability commonly found in different high schools, there is every reason to expect some schools to show changes differing from the most frequently observed pattern. The quality of Bell's work, however, is so deficient that there is no certain means for deciding what changes actually occurred in any of the four schools from which she collected data. While it is entirely possible that some high schools may have pupils whose mental ability is, on the average, below that of the former pupils of the same schools, it is impossible to determine whether any of the schools which Bell studied have experienced such a decline.

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[5] For example, the total number of pupils for whom test scores were obtained in 1934 is mentioned on five different occasions, with a different value given for this total in each of these five instances. There are a number of instances in which a series of subtotals disagree with their grand total. A frequency distribution, shown twice and quite clearly covering the same data, agrees perfectly in all intervals except one, in which there is a discrepancy of 20 cases.

Summarization at this point would necessitate the conclusion that the best evidence derived from those few studies which have utilized data obtained through retests in the same schools indicates that increasing high-school enrollment has been accompanied by a gain rather than by a loss in the average level of ability, as measured by group tests of intelligence. When the results of other direct comparisons, made by using the extensive data that have been compiled in this chapter, are taken into consideration, the conclusion is similar—that there has certainly been no decline in the average intelligence quotient of pupils attending the high schools and that there is some evidence which suggests that there has been a slight upward trend. Little attention has been given to possible changes in the variability of the pupil population as enrollments increased. In a few locations from which data on this point have been reported [for example, Minneapolis (41) and Indianapolis (60)], it appears that mental test scores collected recently show not only a higher central tendency but also greater homogeneity than had been observed among earlier groups of pupils in the same schools. If the proportion of very inferior pupils had increased, without reducing the central tendency of the entire group, a marked increase in heterogeneity would characterize the more recent distributions of test scores. Thus the little available evidence on changes in variability serves to reinforce the conclusion that the high schools have not found an excessive proportion of inferior individuals among their greatly increased clientele.

These conclusions do not take into account the materials that were reviewed in the earlier portions of this chapter. It is true that those materials were derived from studies that used relatively roundabout methods, with their most adequately supported conclusions consisting of inferences drawn from evidence regarding selective elimination. It must be recognized, nevertheless, that the general trend of the evidence coming from these indirect studies favors the commonly held belief that the general level of mental ability in the high schools has been declining and that the high schools have been receiving an increasing proportion of inferior pupils. The inconsistency between conclusions that have come from the two types of study with which this chapter has been concerned requires further examination. This will be postponed, however, until certain new data have been presented.

Chapter III

REPEATED TESTS IN TWO HIGH SCHOOLS

Examination of the studies which were discussed in the preceding chapter makes it apparent that there are numerous obstacles to be overcome in obtaining complete evidence regarding any changes that may have occurred in the quality of the high-school population. The facts which have been presented thus far necessitate the rejection of the widely held belief that pupils now in high school are on the average inferior to their predecessors in measured mental ability. However, complete knowledge of the influence of those forces that may be producing changes in the mental ability of the high schools' clientele will require carefully controlled studies. These studies should be conducted on a fairly large scale and under a variety of conditions in different sections of the country until there is accumulated much more extensive evidence than is now available. Direct comparison of pupils attending the same high schools at different periods probably offers one of the best means for discovering some of the needed facts. Viewing these facts in their relationships to the social conditions in which they were developed should be a prerequisite to deciding certain social and educational issues to which they are relevant. These issues will take on added importance during the early postwar years if, as may well be anticipated, high-school enrollments increase to include a proportion of youth greater than that which attended high school in the prewar period.

It is difficult to find school records kept in such form that they lend themselves to use in comparative studies of the kind needed. At the present stage of knowledge, almost any careful comparison of the pupils now attending a high school with pupils who attended the same high school a decade or more ago would be useful. Because of the course that enrollment gains have followed, comparisons covering a fairly long period are of greatest importance.

The pages that follow present comparisons of contemporary and former high-school pupils based upon the results of an intelligence test that was given on two occasions in the same schools. Data for these comparisons were collected in two communities, both of which are in the Midwestern section of the country but in different states. The larger of these communities is a small city and its tributary areas; the smaller is a farm community centering around a rural village. The choice of these particular communities for this investigation was influenced by several factors. First of all, these communities were available for consideration because records accumulated through intelligence testing had been preserved in such condition that they were suited for use in a comparative study of this kind. Furthermore, in most respects both communities appeared upon preliminary survey to have been relatively stable during the period to be covered; they had not undergone far-reaching modifications such as may be observed in many communities where new industrial, commercial, or other activities have wrought radical changes in the population and in the lives of the people. Also, school organization in these communities had not been modified to such an extent as to interfere with comparisons of the kind that are needed here. Finally, the school authorities in each of the two school systems were found most willing to co-operate and to assist in furnishing supplementary data, without which it would not have been feasible to undertake a study of this kind.

A. Comparisons in the City High School

The larger of the two communities will be considered first. Test results for the pupils who attended high school there in 1922-23 were available for comparison with scores that could be obtained by repeating the same test on those pupils who came to high school nineteen years later, in 1941-42. The area served by the school system of this community consists of a small Midwestern city and its near-by surrounding rural territory. The city, which is the county seat, is the county's only population center of more than a few hundred people. The neighboring territory in adjacent counties is likewise predominately rural. The attendance area from which are drawn the high-school pupils who have been subjected to study in this instance includes all of the city and a vaguely defined rural territory that comprises the major part of the county. Since the area which furnishes these pupils extends outside of the city but does not include the entire county, there have been difficulties in obtaining information about certain characteristics of the population. It has not been possible, for example, to determine with precision how many persons of high-school age were living in the area at any period. Because of this lack of records for the exact area from which the pupils involved in this study were drawn, census records for both the city and the county have been utilized. Records for the city are not sufficiently inclusive, while those for the county are based upon a population somewhat larger than that which this school system serves. Both sets of data show something, however, as to the population gains that might have affected increases in high-school enrollment. Records for the entire county are more useful for this purpose for two reasons. First, most of the rural portion of the county has contributed to the high-school enrollment regularly throughout the years. Thirty-five per cent of all the high-school pupils in 1941-42 came from outside the area incorporated in the city school district. This percentage has been almost constant, having shown a small but consistent increase, during the past nineteen years. The city superintendent of schools estimates the number of high-school pupils coming from outside the city school district as 29 per cent of the total high-school enrollment in 1922-23 and as 33 per cent in 1926-27. Therefore, we may properly use the county rather than the city population records for studying changes in the population being served.

Furthermore, county census records for successive dates are comparable, while those for the city are not, because of changes which have been made in the official boundaries of the city (not the school district) in such a manner as to exaggerate the record of its population gains. The difference between the rate of population gain of the city and that of the total county is apparently due in part to this factor. In view of the foregoing, from which it is obvious that we must depend upon approximations in considering population growth, the following comparison of high-school enrollment with high-school-age population will be recognized as only a rough indication of the extent to which the proportion of youth attending high school in this community has increased.

	1920 N	1940 N	Gain %
(a) City population, ages 14 to 17 inclusive	801	1,375	72
(b) County population, ages 14 to 17 inclusive	1,818	3,022	67
(c) High-school enrollment	621	1,773	186
Ratio of (c) to (a)	0.78	1.29	
Ratio of (c) to (b)	0.34	0.59	

Because these data furnish only an approximate estimate of the extent to which an increased proportion of the high-school-age population in the area being studied is enrolled in high school, a different approach was also made to the matter. This consists of a comparison between enrollment in the sixth grade[1] of the elementary schools of the city and enrollment in high school, as is shown here:

Mean Enrollment	1918-22	1922-26	1926-30	1930-34	1934-38	1938-42
(a) Grade 6	245	318	294	324	340	338
(b) Each high-school grade.	150	214	262	344	370	423
Ratio of (b) to (a).	0.61	0.68	0.89	1.06	1.09	1.25

There are available here three rough indexes of the increase in the proportion of high-school-age youth enrolled in high school, derived through comparing the number of persons enrolled in high school with three different groups, (a) the 14 to 17 year group in the city, (b) the 14 to 17 year group in the entire county, and (c) the number enrolled in the sixth grade in the city. The results of these comparisons are all fairly consistent. Beyond this, it has been found that the high-school enrollment gained 186 per cent while the youth population of the area was increasing less than 70 per cent. In view of this evidence, it seems reasonably safe to estimate the percentage of high-school-age youth enrolled in high school in this community in 1940 as only slightly less than twice the percentage so enrolled twenty years earlier. Therefore, even though the gain in the percentage of youth attending high school in this community has not been determined with precision, it is certain that this gain has been sufficiently large to assure an appreciable decline in the level of academic ability to be found among the pupils if the increment in enrollment has been drawn from strata of the population that are markedly inferior to those from which pupils more highly selected with respect to this factor came at the earlier date.

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[1] The sixth grade probably had relatively little elimination at any time during the period, and its enrollment in any year can therefore appropriately be used as a measure of the size of the group of city residents on which the high school could draw for its ninth grade three years later. A complicating factor is introduced through changing practices of promotion, which have reduced somewhat the percentage of children held in this grade for more than one year. Other limitations of this measure exist in the influences of fluctuating migration and in the decreased birth rate of the early depression years. Also, since 1923, there has been a small gain in the percentage of high-school pupils who came from rural schools outside the city. Beginning about 1940, a few sixth-grade children were transported into the city from outlying rural districts.

Evidence regarding the ability of the pupils who were attending high school in this community in 1923 was obtained in the form of scores on the Miller Mental Ability Test. Because of certain characteristics of this test, it is particularly well suited for the purposes of the present study. The Miller Test, unlike some other early group intelligence tests, does not include items of information which happened to be attracting popular attention at the time when the test was constructed but which later passed out of the public eye. Neither are its items, for the most part, directly associated with any specific high-school subject. It is improbable that curricular changes in any school subject have modified greatly the extent to which successive classes of children became familiar with the materials represented in this test, since it differs from the general information type of intelligence test in that each item presents the person being tested with a relatively unique problem to be solved. For example, forty items (one-third of the total test) consist of "scrambled sentences," each of which, when properly rearranged, furnishes either a set of directions to be followed or a question to be answered. These directions and questions require only information that is very generally possessed by children of beginning high-school age, such as: "Does Christmas come in December?" "What is the number of days in a week?" and "Who is President of the United States?" Thus successful responses to these items depend primarily on ability to rearrange the "scrambled sentences" in such a way as to give them meaning. A second section of the test is made up of forty items which require the discovery or recognition of cause-and-effect relationships. The remaining forty items are conventional verbal analogies. While no elaborate analysis of the test has been made, consideration of its obvious characteristics suggests that facility in dealing with verbal materials, and with more or less novel problems presented through the use of verbal symbols, is an important factor in determining the success of the individual who attempts to answer the questions and solve the problems which it presents. Furthermore, some premium is placed upon speed of response to these materials, as may be seen from the fact that the percentage of test sections completed by the 1942 pupils within the established time limits ranged from 33 in grade nine to 48 in grade twelve. It is also to be noted that the test is more highly reliable than most of the short group tests that have been in common use (15) and that it compares favorably with other tests of this sort in the effectiveness with which it can be used to predict academic achievement (30).

The original testing by which the data for this study were collected was done on April 5, 1923. Scores were obtained at that time for 651 high-school pupils, out of 874 whose names were listed in the school rolls during the 1922-23 school year. The same form of the test was administered during the second week in April 1942, to 1,321 of a total of 1,602 who were enrolled up to that date in the 1941-42 school year. It may be noted that the number tested in 1923 amounted to 74 per cent of the total enrollment for the year, whereas the number tested in 1942 was 82 per cent of that year's total. These percentages are not based on enrollments as of the date of testing, but instead upon numbers that include all persons who left school prior to the date when the testing was done and, in the case of the 1923 data, all who came into the school during the remainder of the year. Thus the coverage of the pupil personnel at the times of testing was more nearly complete than these percentages suggest. The difference in the percentages of the total enrollment for the year tested in the two instances may be due to a combination of three factors. First, the rate of pupil turnover for the two years is not known to be identical. Second, while an attempt was made to obtain a score for each pupil who was at school when the testing was done, the extent to which absenteeism occurred on those days was not verified. Third, there was one detail of procedure in administering the test in 1942 which varied from that which was followed on the earlier occasion. In 1923, all of the testing was done in a single day, and no test scores are available for those persons who were not present for testing on that day. It was not feasible to complete the 1942 testing in such a short time, as the group of pupils had become much larger and had been divided between two buildings that were several blocks apart, with some 300 of the total attending the second building. Testing in the main building was done on two successive days. On the afternoon of the second day the principal of that building called into the testing room all pupils present at that time who were known not to have taken the test. This resulted in obtaining scores for about 5 per cent more individuals than would have otherwise been included. Testing in the smaller building was spread over a period of several days, with one or more groups being tested each morning until scores had been obtained for 91 per cent of the number of pupils enrolled in this building. It is probable that the increase in the percentage of total enrollment tested resulted mainly from this shift in procedure, by which there were obtained scores for a few pupils who were absent from the testing room at the hour first designated for them.

There were no deliberately arranged differences between procedures followed in 1923 and 1942, beyond the one described in the preceding paragraph. Instead, all conditions other than this were kept as nearly uniform as possible on the two occasions. It was not possible to use the same examiner in 1923 and 1942. While different individuals administered the tests, they were both well-trained, experienced examiners. The same examiner's manual, prepared by the author of the test, was followed in both instances. Members of the 1942 group were not familiar with the test, as it had not been used in the school for a long period preceding that date. Neither do they seem to have been more familiar with objective test forms in general than were their 1923 predecessors, as there had been exceptionally extensive use of a great variety of objective tests, both at the elementary and at the high-school levels, in this community throughout the period between 1916 and 1923. None of the conditions under which the examining was done on the two occasions is known to have changed in such a way as might tend to make the scores incomparable.

A preliminary comparison of the raw scores of the two groups of pupils gave these results:

Year	N	M	S.D.
1923	651	64.7	19.0
1942	1,321	69.2	17.8
D		-4.5	
t		5.0	

From this comparison it is obvious that in this community the high-school pupils who were available for testing in 1942 surpassed those of 1923 in measured mental ability. At the same time it should be noted that the increase in mental ability has been accompanied by a slight shift in the direction of greater homogeneity. When the reliability of the difference between the means is considered, it is apparent that the 1942 sample is from a pupil population which is superior to that of 1923. However, it is necessary to carry the analysis at least one step further before the meaning of this apparent difference is entirely clear. The figures that have been tabulated above do not take into account the chronological age differences which these two groups of pupils exhibit. Data with respect to this point, expressed in terms of chronological age in months, computed to April 5 of the year of testing for each group of pupils, show that the 1942 pupils are on the average 1.8 months younger than were their predecessors when they were tested nineteen years ago. Since it is known that in unselected groups of pupils within the age range represented here, a substantial positive correlation exists between raw scores on mental tests and chronological age, the difference between the intelligence of these two groups is probably partially obscured by their difference in age. In so far as pupils of the ages represented here continue to gain in ability to score on a test of the kind that has been used in this study, the age difference between the groups must be taken into account. If as they grow older pupils of this age gain in mental ability as measured by the Miller Test, and it is known to be true that they do (17), it is clear that the direction of the age difference between the two groups that are being compared is such as to result in an underestimate of the true difference between their mental ability. That is to say, it is practically certain that the 1942 pupils would have shown even greater superiority in mean raw scores had they been tested 1.8 months later, when their average age had become equal to that of the 1923 pupils at the time when they were tested. Direct combination of differences in age and differences in raw score, for the purpose of expressing the true difference between the mental ability of the two groups of pupils, is not feasible. Since the available records for the 1923 pupils are not in a form that permits the computation of an intelligence quotient for each individual, the comparison cannot be made in the relatively simple manner that would be used if intelligence quotients could be utilized. As an exploratory step, comparisons were made between the raw scores of the 1942 and 1923 pupils within each high-school grade. These showed consistently higher mean scores, and greater homogeneity, grade by grade, for the pupils of 1942. Similarly, age comparisons revealed that the 1942 pupils were, on the average, younger in every grade and more homogeneous with respect to age. To carry the analysis further, subgroups classified according to age were compared to determine the amount of difference in raw scores with the influence of age greatly reduced. The details of this comparison are shown in Table II.

TABLE II

COMPARISON OF RAW SCORES OF SUBGROUPS CLASSIFIED ACCORDING TO AGE

Age	1923			1942			M_1-M_2	t
	N	M	S.D.	N	M	S.D.		
Below 14-6	75	65.8	16.6	104	70.8	16.6	-5.0	2.0
14-6 to 15-6	143	61.6	20.5	314	66.6	16.8	-5.0	2.6
15-6 to 16-6	159	64.2	18.4	387	67.3	17.4	-3.1	1.9
16-6 to 17-6	121	64.5	20.3	305	74.2	17.5	-9.7	4.6
Above 17-6	153	67.4	18.7	211	69.4	19.0	-2.0	1.0

It should be noted that the differences in mean score in each instance favor the pupils who were in high school in 1942. Even though these differences vary in magnitude, the consistency of their direction and the degree of reliability that attaches to each of them fully justify the view that they are to be attributed to a real difference between the pupils of the two periods, and not to one that has resulted from sampling errors.

While the evidence that has been presented thus far conclusively disposes of the assumption that the 1923 pupils were either equal or superior to their successors of 1942, it has not been analyzed as fully as some readers may wish. In order to eliminate the distorting effect of age differences that interfere with a simple comparison between the scores of the two groups and thus to obtain a single value representing the difference in mental ability free from the influence of the age difference, a method which is both precise and comprehensive is desirable at this point. Johnson and Neyman (24), following the work of Kolodziejczyk (27), have developed a statistical technique which is admirably suited for dealing with problems of this kind. The Johnson-Neyman formulas can be applied to these data in such a way as to overcome most of the disturbing influence of the background factor of chronological age. By this method there can be obtained both a measure of the difference between the mean scores of the two groups, with most of the distorting effect of the age factor eliminated, and also an estimate of the variance of the mean difference in scores, thus affording a ready answer to the question of the reliability of this difference. By classifying the data into the five age categories that are listed above, the weighted difference between the mean raw scores was computed according to the Johnson-Neyman technique and found to be 4.76. This value may be described as the mean amount by which the raw scores of pupils of equal age favor the group that was tested in 1942. The variance of this difference between the two means is 0.72. From this, the value of $\underline{t}$ is found to be 5.6, which, for the large groups being dealt with here, far exceeds the value which corresponds to the 1 per cent level of significance. It can therefore be concluded with practical certainty that the 1942 pupils represent a population which is superior in measured mental ability to the population represented by those pupils who were tested in 1923.

The evidence presented thus far is sufficient to dispel any doubt regarding the existence of a difference in test scores favoring the pupils who were tested in 1942. The extent of the superiority of the 1942 pupils may be considered further at this point. Because of the form in which the data from 1923 were recorded, it is impossible to compute an intelligence quotient for each individual who was tested at that time. A measure of the magnitude of the difference, which, even though relatively crude, carries more definite meaning than can be attached to a raw score, can be obtained through expressing the difference between the mean scores of the two groups in terms of the test norms. Professor Miller indicates that a gain of 6 points in raw score represents an increase of

1 year in mental age (30, p. 20). The observed difference in mean raw score shows that the average advantage of 1942 pupils over 1923 pupils of the same chronological age is 4.76. This difference may be taken as representing approximately 9 months in mental age. Thus, with respect to those qualities which are measured by the Miller Mental Ability Test, one may regard the average pupil of 1942 as being ahead of those of 1923 by an amount about three-fourths as great as the gain in mental age made by typical individuals in a year.

One further comparison which ignores age differences, but which is enlightening because it takes into account changes throughout the entire range of ability, is presented in Table III.

TABLE III

COMPARISON OF RAW SCORES ACCORDING TO PERCENTILE RANK

Percentile Rank	1923	1942	Increase
Highest score	109	115	5
90th percentile	89.5	93.4	3.9
80th percentile	82.5	85.6	3.1
70th percentile	75.9	79.2	3.3
60th percentile	69.7	74.2	4.5
50th percentile	64.8	69.2	4.4
40th percentile	59.7	64.3	4.6
30th percentile	53.3	59.3	6.0
20th percentile	46.4	53.1	6.7
10th percentile	40.6	45.3	4.7
Lowest score	5	14	9

This table reveals that the increase in the average level of mental ability which has been observed has not been limited to any one portion of the distribution. Instead, it is obvious that the increase has been general, with gains occurring throughout the entire scale. The lower portion of the scale shows increases which exceed to a small extent those of the upper portion, with the largest difference appearing near the lower quartile. In connection with this point it may be recalled that the 1942 group is slightly more homogeneous with respect to the ability that has been measured than was the group tested in 1923. Proof of this can be seen in the standard deviation of the raw scores for the total groups and in most of the subgroups for which standard deviations were computed. From these it is clearly evidenced that among the 1942 pupils there is not even a small group whose measured mental ability is inferior to that of their predecessors of nineteen years ago. Instead, the poorest representatives of the present group compare favorably with those who stood lowest in the earlier group, even though the comparison is being made in such a way as to assess an age penalty averaging 1.8 months against the more recent pupils. Consideration of the total distributions from the two groups whose mental test scores have been compared here shows that the superiority of those who are currently enrolled holds throughout the entire range of mental ability for which a record was obtained. The average measured mental ability for the current group is higher; the proportion of all the cases that exceed any given level is greater. Cases of very low scores on the mental test occur with less frequency than formerly; the occurrence of very superior scores has become somewhat greater than before. Thus *all of the evidence that has been obtained through these comparisons contradicts the assumption that increasing high-school enrollment has resulted in drawing into the high school a class of youth inferior in measured mental ability to those with whom the school formerly dealt*. So far as the community in which these data were collected is concerned, it seems that the sources from which additional pupils came, furnished a class of persons who had the capacity not only to equal but to excel those who formerly attended high school there.

While the foregoing shows that there has been a marked increase in the measured mental ability of high-school pupils in this community since 1923, no evidence has been presented as to the possible causes of the increase that has been observed. Among the factors to be considered in this regard are possible changes in the composition of the population of the area during this period. If the mobility of the population of a community were sufficiently extreme, it is obvious that an entirely different group might furnish the pupils found in the same high school at different times. While complete records of population movement were not available, evidence which has been obtained gives some indication as to the extent and nature of changes that have been brought about through population movements. First of all, the increase in population has been examined. *United States Census* records the population of the county since 1900 as follows:

Year	1900	1910	1920	1930	1940
Population	20,873	23,426	24,519	35,924	36,534

During the twenty-year period (1920-1940), the total net increase was thus recorded as 12,015 persons. Comparison of birth and mortality statistics, as recorded by the State Department of Public Health, shows the net natural increase (the excess of recorded live births over deaths) for the county as 8,232 during this twenty-year period. From this the county's net gain by migration during the twenty-year period may be computed as 3,783, or slightly more than 10 per cent of the 1940 population. It is apparent from census records that the rate of population gain was not constant, but that most of the increase occurred before 1930. Examination of census, birth, and mortality records for each of the two decades separately, following the procedure used for the total period, shows that migration added 6,780 persons to the population from 1920 to 1930 and that it resulted in a net loss of 2,997 during the following ten years. Local inquiries revealed that the movement of workers into the community following World War I had almost entirely ended in 1929 and that a considerable share of this migration, and of the increase shown by the 1930 census, had occurred before 1923. Little could be found regarding migration outward from the area between 1923 and 1929, but certain groups moving away since that time have been identified. From all that has been learned of population movements in the area, it seems that the proportion of migration has been small. Nevertheless, the number of persons involved was sufficient to warrant giving some consideration to possible influence of their movements. If either the group that has moved into the community or the group that has withdrawn differed in mental ability from the original (1923) population, this selective migration might have exercised some influence on the level of mental ability of the group from which the 1942 pupils were drawn. While research on selective migration has shown that migration is generally much less selective with respect to such qualities as mental ability than was formerly believed (44), records that might bring to light any local conditions peculiar to the community in which this study was made have been examined in an attempt to discover possible influences of this kind.

First of all, *United States Census* records for the county furnished the following facts, indicating that in certain respects the composition of the population has changed but little over a long period.

Year	1900	1910	1920	1930	1940
Percentage native white . . .	96.9	97.0	97.0	97.6	98.1
Percentage foreign born . . .	1.0	1.2	0.9	0.8	0.7

It is therefore reasonably certain that between 1923 and 1942 the community underwent little change that can be attributed to the migration of foreign groups. These data, supplemented by information obtained through local inquiries, ruled out any possible effect of language handicaps such as are sometimes encountered in testing children who come from homes in which languages other than English are spoken.

While records to show other possible effects of internal migration were not readily available in such convenient form, it has been possible to obtain evidence that is of some help on this point. Most of this evidence comes from studying employment changes in the area. For this purpose, all of the larger groups of workers in the area were identified, and information regarding changes in the size of the various groups employed during the period was collected.

The largest single source of employment in the area attracted numerous workers into the locality through a long period of gradual expansion until it reached a peak in 1927, with approximately 2,500 men working at that time. This number declined sharply in the early 'thirties, but few families from the group left the area, as these men or members of their families found other employment locally or remained there even though they were unemployed. (There were in the county 609 of these men who were registered as unemployed and seeking work in 1940, according to files of the local office of the United States Employment Service.) Because of the size of the group brought into the area by this industry, some measure of its influence in the community seemed desirable. To obtain such a measure, the test scores of all of the pupils who listed this industry as the source of their fathers' employment in 1942 were segregated for comparison with the scores of all other pupils. (This measure, of course, did not take into account the children of any of those persons who came into the community because of this industry, but who did not continue to be employed in it. No suitable means for identifying these children was found.) The following figures show that the scores of pupils in this subgroup do not differ much from those of the other pupils who were in school at the same time.

	N	Q_1	Md	Q_3
Total, minus Subgroup a	1,176	56.4	69.1	82.2
Subgroup a	145	54.1	69.4	82.8

It is apparent from this comparison that there has been no important effect on the scores of the total group which can be properly attributed to the incoming movement of workers now employed in this industry.

The second largest local industry increased the number of workers on its payroll by more than 400 between 1923 and 1929, when its peak employment was reached. After that date the number engaged in this work decreased until 1942. At that time employment in this industry was slightly below the 1923 level, but almost all of the former employees remained in the locality. (Four hundred and seventeen of them were listed by the local United States Employment Service office as being among the unemployed of the county in 1940.) A few sales representatives and skilled employees from this industry left to find work in other locations; most of those who remained were unskilled workers who had been imported from the hill country of Kentucky and southern Indiana. Many of these were supported by relief and work relief, or eked out a meager existence in the near-by rural portions of the county, where they lived in tar-paper shacks and other improvised quarters. Here, as in the previous instance, it has been possible to segregate the scores of children who recorded this industry as the source of their fathers' employment in 1942. Again there seemed to be no feasible means of discovering the children brought to the community because of this industry, but whose fathers were no longer associated with it. There were among the pupils tested in 1942 a total of 48 who could be recognized as belonging to this subgroup. Their scores differ only slightly from those of the remainder of the pupils, as may be seen from the following:

	N	Q_1	Md	Q_3
Total, minus Subgroup b	1,273	56.0	69.3	82.4
Subgroup b	48	60.6	67.7	80.0

The small size of this subgroup and the minor difference between the scores of its members and those of the remainder of the pupils serve to indicate that the movement into the area of persons now engaged in this industry has been unimportant in its influence on the level of measured mental ability in the total pupil population.

Other employers brought into the locality much smaller groups than the two listed above. One of these, which furnished complete detailed records, showed a net increase of 107 married employees between 1923 and 1942, almost all of whom were professional workers. Many of these new members of the community did not have children old enough to be included in this study. Another employer, newly established in the community, had assembled a working force of 1,450 within the past few years. These were mainly young persons who had grown up in the area. Of the 250 who came from other localities, 225 were unmarried, so it appears that there were no more than 25 families attracted to the locality by this enterprise. Stores, specialty shops, hotels, restaurants, automobile agencies and service stations, and similar establishments have offered increasing employment opportunities in the city, but much of their personnel seems to have been recruited from the younger members of families previously living in the area or in similar rural sections adjacent to it. The number of public-school teachers, social workers, public-health nurses, and other persons working in public agencies increased more rapidly than the general rate of population growth, but the total number of persons brought into the area because of these occupations was small, and while no data were gathered on their families, they represent for the most part occupational groups that have relatively few children.

Throughout the period families with children of college age have moved into the community so that these children could live at home while attending school. There is no means of discovering whether this practice has increased or decreased since 1923, nor is there any direct evidence as to whether such families bring more or fewer children of high-school age than was formerly the case. Other families moving into the city included retired farmers and persons who were attracted by the fact that the local relief administration was reputed to be more liberal than that operating in the surrounding rural communities.

Persons leaving the area included (a) unknown numbers of young people looking for employment in industrial, commercial, and professional occupations, (b) between 200 and 300 men formerly employed in railroad shops, (c) somewhat less than 100 iron and steel workers, (d) laborers in construction and factory work and, very recently, (e) a small number of mature professional workers who have gone into government service.

The many influences that have helped to determine population changes in this area and the limitations of available data regarding the movements that have taken place make it impossible to appraise in an exact manner the effects of such movements on the level of mental ability existing in the population from which the high-school pupils being studied were drawn. It is apparent, however, that there has been no wholesale movement of either intellectually superior or inferior families into this area, nor has there been any widespread exodus of a deviate group. Instead, it appears that expansion in various occupations went on in such a fashion that no sweeping modification in the composition of the population resulted. Therefore, in view of the fact that internal migrations are ordinarily not highly selective with respect to intelligence, it seems probable that population movements during the period with which this study is concerned have done little to modify the level of mental ability in this community.

The reasons for the superiority of the test scores of the present high-school pupils as compared to their predecessors of 1923 cannot be established from the data that have been presented here. The superiority of the current group is clear; the possibility that this superiority resulted from population changes growing out of selective migration is remote. The assumptions that the high schools formerly drew the superior youth and that those who did not attend were as a class inferior are therefore clearly contradicted by the observations that have been made.

B. Comparisons in the Rural Village High School

As one means of checking the foregoing findings, an attempt was made to repeat the comparison under somewhat different conditions. A small township high school which serves a rural village and the near-by surrounding agricultural territory was utilized as a source of data for this supplementary study. Test scores for the pupils who attended this school in 1925-26 were available for comparison with the scores of pupils who attended the same school sixteen years later, during the school year of 1941-42.

This community had undergone numerous changes of such a nature that there might have been some modification in the level of mental ability characterizing the population from which the high school drew its pupils.

A description of some of the conditions existing in this community and of certain changes that occurred during the period in question will indicate how the setting for this comparison differed from that of the foregoing one. At the same time, some inferences as to possible changes in the population are suggested, but without overlooking the present views of authorities on the effects of selective migration upon the quality of population. This community is in the Midwestern part of the United States, but it is not in the same state as the one in which data for the previous comparison were collected. It is in one of the most fertile and highly productive portions of the cornbelt, where modern agricultural practices prevail. The economic life of the village depends almost exclusively upon the agricultural production of the surrounding farms. Improved roads and the accompanying use of automobiles and motor trucks have reduced the social and the economic importance of this village to a marked degree. Local business enterprises that had been relatively prosperous in 1920 had already begun to suffer from the competition of larger trading centers in 1926; between 1926 and 1942 this produced far-reaching changes in the economic activity of this little community. Much of the business that was formerly transacted along "Main Street" had been transferred to a near-by city. A number of local business ventures closed their doors; most of the others were obviously operating on a reduced scale. A local resident who had lived in the village throughout this period commented on some of the changes that had taken place there by saying:

> Fifteen or twenty years ago we had some right good stores here, and about everybody depended on them. But now most folks even buy their groceries in __________ (35,000 population, less than twenty miles away). They figure they can save enough that way to pay for the gasoline it takes to drive in there once a week. Besides, they can go to the movies on the same trip, or they park their cars on downtown streets and just sit and watch the crowds on Saturday afternoons or evenings, so they don't do much buying here anymore. I generally drive in with my family every Saturday.

Life on the farms of this section had also changed. The use of power farm machinery had increased rapidly, especially during the latter part of the period. A new crop, the soybean, which was rapidly becoming one of the most important agricultural products, was of such a nature that its production and marketing required very little hand labor. The mechanical corn picker and other new or improved machines helped make it possible for one man to cover greater acreages. Thus, even though shorter working hours prevailed on the farms, the trend was toward the cultivation of larger areas by each farmer. The use of transient seasonal labor on the farms had decreased; the proportion of land owned by nonresidents and operated by tenants was greater than it had been before. Families of some of the former farm-owners left the land. Those who were young enough to do other work went to the cities; those who were older moved into the village when they retired. Replacements on the farms were brought in from the much poorer farming lands of Kentucky. This was the only group that could be identified as having moved into the area during the period. All told, the vocational opportunities afforded by the village and its neighboring farms were not sufficient to keep all of the young people in the locality after they reached working age. Beyond this, there were other losses through the migration of some of the more active adults, who moved away in search of work. The decrease in total population is shown by the following figures, which were taken from United States Census:

	1930	1940	Loss
Village	676	652	24
Township	1,520	1,367	153

Data showing total changes in the age composition of the local population were not at hand. Pertinent evidence as to the nature and general direction of the shift in age composition of this community was found, however, in records maintained by the office of the county superintendent of schools. These files show that the number of children of school age living in the township decreased 23 per cent between 1930 and 1940. It should be noted that the total population of the township decreased only 10 per cent during the same period. No sources of further pertinent information regarding the composition of the local population were discovered. The changes that have taken place in this rural community are, of course, not unique. Instead, they are paralleled for the most part by changes that have occurred in a great many other Midwestern agricultural communities. While these data are not presented as representative of rural Midwestern communities in general, they were collected in a local setting which could easily be found existing in many parts of the Middle West.

Enrollment in the high school in which this study was made reached a total of 58 pupils during the 1925-26 school year. The best records that could be obtained on the size of the age group from which these pupils came indicate that this enrollment amounted to approximately 40 per cent of the youth of high-school age who lived in the district at that time. Sixteen years later, in the 1941-42 school year, the total enrollment of the high school (to April 2) numbered 93. The best estimate of the total high-school-age population of the district at that time indicates that this enrollment included more than 80 per cent of the total age group from which these pupils came. Thus, of all youth living in this district, it seems that the proportion attending high school was approximately doubled during an interval of sixteen years. If those pupils who were attending the school in 1925-26 were much superior in mental ability to their contemporaries who had left school at that time, and if the general level of mental ability among the youth of the community did not change markedly during the sixteen years that followed, such a large increase in the proportion of youth attending high school would almost certainly have brought into the school pupils of lower mental ability, and thereby have reduced the average level of mental ability to be found among the more recent group of pupils.

The Miller Mental Ability Test, Form A, was given to all pupils who were present in this school on February 24, 1926. Scores for 50 persons were obtained on this occasion. The same test was again administered, on April 2, 1942, to all pupils who were present on that day. In this instance scores were obtained for a total of 89 individuals. The conditions under which the tests were given on the two occasions were, as in the case that was described in the preceding pages, closely similar. Since the population was composed entirely of native-born whites, no testing problems growing out of bilingualism were encountered. No unusual conditions of any sort interfered with the administration of the tests. The pupils were not familiar with the test, as it had not been in use in this school during the past fourteen years. The same examiner's manual was followed, and the standard procedures which the author of the test established for its administration were adhered to in each instance. The only known difference between conditions under which the two sets of scores were collected was due to the variation in the season of the year at which the tests were given. This difference in the time of year at which the testing was done amounted to approximately five weeks. While the effect of this variation upon the comparability of the test scores is not known, it can be assumed to be of very small importance. The scores from the two groups have been treated as comparable, with no attempt at any correction for the effects of this seasonal variation.

Because of the relatively small numbers of persons in these two groups, no subdivisions of the data were made. Instead, the accompanying comparison is based upon distributions that included the raw scores of all members of the respective groups of pupils.

Year	N	M	S.D.
1926	50	71.6	16.1
1942	89	71.6	16.5

It is apparent that there are no differences of consequence between the measured mental ability of the pupils of 1926 and that of their successors of 1942. Instead, these two groups are quite nearly alike, with respect to both central tendency and variability. Unless some complicating background factor is concealing a real difference between these two series of scores, it is appropriate to conclude that the measured mental ability of the pupils in this high school in 1942 is not different from that of their predecessors who were there sixteen years previously. The most important background factor to be examined before accepting this conclusion is that of chronological age, which is ordinarily positively correlated with raw intelligence test scores to a fairly high degree. As a first step in determining the possible effect of an age difference, comparison of the ages of the two groups at the time of testing, expressed in months, was made by computing means and standard deviations, with these results:

Year	M	S.D.
1926	198.5	16.5
1942	198.4	12.0

Since the ages of both groups were computed to the time of testing, a correction taking into account the difference between the season of the year at which the two groups were tested may be suggested. However, this difference amounts to only five weeks, or approximately one-tenth of a year. While it is in the direction of increasing the amount by which the 1942 group of pupils were found to be younger than those of 1926, it is too small to be given much attention. Instead, the age differences between the two groups may well be regarded as negligible, so far as their central tendencies are concerned. It may be noted that the more recent group is somewhat less variable. All in all, the two age distributions do not differ by an amount sufficient to necessitate taking their differences into account when comparing the intelligence scores of the two groups. Therefore, without any more complete analysis, the direct comparison of raw scores previously given will be supplemented only by the following figures, which furnish more specific evidence that no excessive proportion of pupils with inferior mental test scores appeared in the more recent group.

	1926	1942
N	50	89
90th percentile	89	95
Q_3	85	84
Md	69	69
Q_1	62	61
10th percentile	48	51

While these values are based upon numbers so small that minor differences are of no importance, it is clear that no excessive accumulation of pupils who make low scores exists in the 1942 group. It is apparent, instead, that the mental ability of the 1942 pupils, as represented by their raw scores on the intelligence test used in this investigation, is in no sense inferior to that of pupils attending the same school sixteen years earlier. Thus it appears that in this instance a high school in a community that exhibits considerable evidence of decline in some respects has nevertheless been able to double the proportion of the total youth of the community which it enrolls without either a decrease in the average level of measured mental ability among its pupils or a greater proportion of pupils whose scores on a test of mental ability are inferior to those made by their predecessors.

The high schools of two communities that differ widely in certain respects furnished the main data for this chapter. These data included mental test scores collected under comparable conditions on two occasions, separated in time by periods of nineteen and sixteen years. The proportion of all youth of high-school age attending high school increased greatly in each of the two communities during the periods in question. While it is commonly held that such increases in enrollment bring into high school excessive numbers of mentally inferior pupils and that the average level of mental ability to be found in high schools has decreased as enrollments increased, no evidence of adverse changes in the ability of high-school pupils has been found. Instead, in the more extensive of these two sets of data, there is conclusive evidence that the measured mental ability of the pupils attending high school in 1942 surpassed that of the pupils who were in high school in the same community nineteen years earlier. In the second set of data, which is much more limited, it appears that the pupils of 1942 and those of 1926 were equal in measured mental ability.

Chapter IV

INTERPRETATIONS AND IMPLICATIONS FOR EDUCATION

Chapters ii and iii were devoted to the presentation and analysis of extensive evidence pertaining to the question of possible changes in the mental ability of the high schools' clientele. It is possible to classify all of this evidence into two broad categories. These may be termed, for the sake of convenience in this discussion, (a) evidence of an indirect nature, but from which inferences as to the changing nature of the high schools' clientele may be drawn and (b) evidence resulting from direct comparisons of the mental test scores of pupils who attended high school at different periods. A great many studies have furnished evidence which belongs in the first of these two classes. Thorndike's study and others which have assumed a high positive correlation between intelligence and persistence in attending school are to be included here. Certain reports regarding the mental superiority of early high-school pupils, obtained from several different sources, also belong in this category. Comparisons between high-school pupils and adults, between high-school pupils and pupils in continuation classes, and between pupils who attended high school and those who were eliminated from the lower grades also have been used as evidence of this sort. While there are variations as to detail, the general outcome of this approach has been such as to furnish support for the belief that increasing enrollments would bring disproportionate numbers of mentally inferior youth into the high schools and thereby lead to a lower average level of mental ability among high-school pupils. All of this evidence is referred to as indirect because of the fact that it furnishes no more than the basis for an inference as to what kind of pupils would be brought into high school by increasing enrollments accompanied by a decreased degree of selection.

All of the research that has been done thus far leaves room for considerable doubt, however, as to the amount of selection with respect to intelligence that actually operated to determine the nature of the group attending the secondary schools of the United States at any period. Estimates of the extent to which such selection was operative during the early years of this century are probably only a little better than guesswork. Most writers who discuss changes in the high-school population, instead of looking for facts that would show what level of ability actually existed among former high-school pupils, apparently have followed the type of reasoning upon which Thorndike based his widely quoted conclusions (50), or perhaps they have accepted these conclusions without making further inquiry into the matter. Serious question regarding these conclusions arises because of uncertainty as to the true quality of the clientele of the high schools during earlier years. No one has ever demonstrated that the small fraction of American youth attending high school prior to World War I was made up of persons who were superior to those who left school because they preferred to work. Likewise, those who in that early period had no ready access to high-school facilities may in many cases have been fully equal in potential academic ability to those who attended school. Thorndike's conclusions, and much of what has been written and spoken more recently regarding the inferiority resulting from the expansion of high-school enrollments, rest at this point on a very uncertain foundation.

When direct comparisons between the mental test scores of those who attended high school at different times are used in an attempt to find how much deterioration there has been in the mental level of the newer and larger group of pupils, the results show that no decrease at all has taken place. Instead, there is evidence that whatever changes occurred have been upward rather than downward. The evidence of this kind, as presented in the foregoing pages, is sufficient, from the standpoint of both quantity and quality, to necessitate the rejection of the belief that high-school pupils of the present day are, on the average, inferior in measured mental ability to their predecessors of any time within the past quarter of a century. Evidence sufficient to support this rejection comes from each of two types of studies. The first of these, which compares intelligence test scores collected throughout the years in different high schools, may be regarded as well-nigh conclusive, despite certain of its limitations. Altogether, the results of mental tests given to about 130,000 high-school pupils, drawn from widely scattered sections covering a large portion of the United States and covering a time span that runs from 1916 to 1942, were utilized in chapter ii. This mass of evidence is clearly on the side of rejecting the hypothesis that the general level of mental ability to be found in the high schools of this country has been declining. The second type of study, which makes use of repeated tests of intelligence in the same high schools and thereby avoids some of the limitations of the first type of direct comparison, must be done on a less sweeping scale. Even so, when the results of all of those studies that have repeated the same test in the same schools are brought together, they are likewise sufficient to establish with a reasonable degree of certainty the fact that there has been no deterioration in the general level of measured mental ability of pupils coming into these high schools. While it is known that variations in mental test scores between different high schools are sometimes relatively large, and while there may well be local instances in which a decrease in mental ability has occurred, careful comparative studies of pupils attending the same high schools at different times have not brought to light examples of such local decreases. Instead, those comparisons of this kind that have been made have ordinarily shown increases in the general level of measured mental ability among high-school pupils as enrollments increased. Furthermore, the range of test scores, or some other measure of their variability, has been reported for a small number of earlier and more recent groups of high-school pupils whose scores on mental tests were being compared. The measured mental ability of groups of pupils who came into high school recently has seldom shown greater heterogeneity than that which existed among earlier groups representing the smaller enrollments of a previous period. Instead, it is common to observe slightly more homogeneity within more recent groups. There is, therefore, no reason to believe that high schools have a larger proportion of dull pupils now than in former years. The conclusion that there has been no deterioration in the general level of measured mental ability of pupils coming into the high schools of this country during the period since the use of group mental tests made large scale comparisons feasible is highly conservative; a more nearly accurate conclusion might give some recognition to a slight upward trend which appeared not only in the major comparison afforded by the original data of this study (chapter iii) but also in the results of certain other investigations which were conducted in such careful fashion that they deserve serious consideration by all who are interested in this question.

What changes in the mental level of the high schools' clientele occurred during the years preceding World War I? Evidence on which a positive answer could be based safely is not now obtainable. The usually accepted belief that this period saw a decrease in the quality of high-school pupils is supported only by reasoning of the kind that led to erroneous views as to changes that took place after that date. This is in itself sufficient to justify some skepticism in the matter. Those who insist on holding to the belief that such a decline went on prior to the time covered by this study will not be very convincing if they suggest that as soon as the tools for collecting pertinent evidence became available a former downward trend was checked or reversed.

The striking inconsistency between the general outcomes of the two main classes of studies mentioned at the opening of this chapter should be examined with some care. If the small enrollments of the high schools during the earlier years were drawn from a favorably selected section of the population, the assumption that the new and larger group must be inferior would hold true if the level of academic ability continued to be constant among successive generations of youth. If, however, it had not been constant, but instead, there had been an upward shift in the level of academic ability in the population from which pupils were drawn into the high schools, the foregoing assumption might be wholly inapplicable. Apparently this upward shift has been taking place. The mental test scores of pupils who formerly remained in school were higher than the scores of those who did not persist in school attendance. But among youth who have grown up more recently and who belong to the classes that formerly left school while very young this inferiority is not evident. The high schools accept and retain them in great numbers, but without finding a lower average level of measured mental ability among this new group of pupils.

What causes contributed to maintaining or improving the general level of measured mental ability among youth coming into the high schools as enrollments grew? Means for arriving at a complete and dependable answer are not at hand. Numerous factors that have possibly operated to some extent suggest themselves. Despite the lack of conclusive evidence as to their effects, one may take the liberty of engaging in some speculation as to how they might have operated.

There are two major sets of conditions that seem to have played roles of some importance in determining changes in the nature of the high-school population. These are (1) changing factors determining the extent to which persistence in attending school depended upon the ability measured by intelligence tests and (2) changes in the general level of this ability in successive groups of the total youth population. The first of these have been described erroneously in many instances; the second generally have been ignored.

The degree of favorable selection that operated to determine who would attend the high schools in earlier times was probably less than has been believed. There have been gross misinterpretations by persons who exaggerated this influence because they failed to recognize the extensive overlapping between groups made up of those who formerly persisted into high school and those who did not (29). Altogether, the amount by which early high-school pupils differed from the great mass of out-of-school children in academic ability apparently has been much overestimated. When these errors are properly discounted, there remains a mass of evidence which cannot be ignored and which indicates that there were true differences in observable academic ability and that these differences, on the average, favored those youth who persisted in high-school attendance. These average differences were apparently relatively small, and it is reasonably certain that the variability of both groups was large enough to create a wide overlap between them. This overlapping was probably great enough to include, among those youth who left high school prior to graduation and those who did not enter high school at all, many whose academic ability was above the average of those who continued in attendance. Among the mentally superior youth whom the early high schools failed to retain, there were no doubt a good many of those active, ambitious, and venturesome boys who at the earliest opportunity left home to work. There must have been a good many highly intelligent boys and girls who dropped out of school because they were irked at their failure to find in the academic program of the school any solution to the problems which were most important to them. There was probably a small minority of other equally intelligent and vigorous individuals (particularly boys) to whom the schools' demands for conformity and docility were sufficient reason for breaking away. So long as there were, outside the schools, attractive opportunities for the very young, some of the more intelligent as well as those of lower mentality no doubt left school because of these attractions. Before the period when widespread unemployment placed sharp restrictions upon those youth who turned from school to enter the labor market, there is good reason to believe that those who left school early in life included numerous youth of superior mental ability. A good example of evidence pertinent to this point is available in data from the

1923 survey of the schools of the state of New York, as may be seen from an analysis reported by Stoke and Lehman (47). The work of these authors demonstrated that, among a very large group of children, approximately half of all those with intelligence quotients of 120 or higher came from families belonging to the occupational classes whose children Counts (10) had found, at about the same time, to be rather poorly represented in the high schools. Other studies, made at various times during the past twenty-five years, have shown that there were many youth, including persons of every level of academic ability, who did not have access to high school under conditions favorable enough to result in their continued attendance. Studies by the American Youth Commission (5) confirmed the findings of other more limited surveys which have shown that in many instances persistence in attendance at school has been influenced more by economic factors than by personal qualities of the individual child. Distance from school was until recently a barrier to attendance which numerous rural youth could not surmount. Not many years ago this barrier excluded from high school a great group of farm boys and girls, among whom every level of academic ability could have been found. Briefly, there are sound reasons for the belief that the out-of-school groups upon which the high schools have drawn as enrollments increased included a substantial minority of boys and girls whose academic ability helped to maintain or raise, rather than lower, the general average in the schools.

It is quite probable that comparisons between children who left school and those who remained have overestimated to a still greater extent the true differences in their *potentialities for mental development*. The child whose prospect for continued schooling is poor often has poorer than average opportunities for the development of his academic potentialities at the maximum rate before he leaves school. The ordinary paper-and-pencil group test of intelligence has much in common with general tests of academic achievement. When children who have been in school for several years are given both a group intelligence test and a general comprehensive achievement test, the scores usually show a substantial amount of correlation. It is common practice to attribute low achievement to low intelligence and high achievement to high intelligence. This amounts to an oversimplification that falls a bit short of the whole truth. Consideration of the nature of the scores reveals a possibility for the converse assumption that low achievement causes low scores on the intelligence test. This holds good only in a limited sense, and its importance should not be exaggerated, but it plays a role that should not be ignored when comparing the intelligence test scores of pupils who differ in achievement. The influence of this factor is in the direction of magnifying the true difference between the intelligence of those children who drop out of school and those who continue to graduation. Because of these complications the relation between intelligence and elimination from school needs further investigation. Until adequate study furnishes contrary evidence, it may be assumed tentatively that among those former pupils whose formal education terminated before they had earned the high-school diploma there were many whose potentialities for mental growth equalled or excelled those of the average high-school graduate. In so far as this was true, the recruiting of additional youth to swell the ranks of successive high-school classes did not draw solely upon an inferior segment of the population.

The average mental test scores of the pupils recently enrolled in several high schools have been shown to surpass that of their predecessors who were attending the same high schools some years earlier when enrollments were smaller. There is no evidence to show that changing bases of selection were responsible for the higher level of measured mental ability that has been found to accompany increased enrollments. While it is possible that some schools may be retaining (or eliminating) pupils on such a basis that selection is now more closely related to the ability measured by mental tests than was formerly the case, such changes in practice would appear to be so rare as to make their influence on the total pattern of selection one of very small proportions.[1] Selective processes in general, while of less consequence than has often been assumed, have almost certainly exercised an influence in the direction of reducing the general level of mental ability as enrollments increased.

It is reasonably certain that the gains that have been revealed by the repetition of mental tests were produced by influences that more than balanced the effects of selection—that is, by influences which have helped to raise the test scores of those youth who came into the high schools more recently. There are a number of factors which may have contributed more or less to the gains that have been observed. Among these is "test-wiseness" on the part of pupils who might have become so well accustomed to taking objective tests that they gained specific skills which enable them to improve their showing. This would probably occur to some degree in schools where objective tests were used with increasing frequency. Little is known as to how this factor may have operated in many of the schools where the data presented in chapter ii were collected. In the schools where the original data for chapter iii were gathered, the 1942 pupils seemed to be no more familiar with objective test forms than had been their predecessors with whom they were compared.

The influence of more general changes in the environment are still less readily evaluated. It should be recognized that the tests of mental ability which are commonly used in the secondary schools measure to an important degree verbal abilities, that is, facility in dealing with facts, ideas, and relationships that are expressed in verbal form. The environment of the majority of children in this country has throughout the past few decades probably become progressively more favorable to the development of facility in dealing with materials of this kind. While many different elements have been combined in producing the changes that might have contributed to maintaining and increasing the average level of measurable mental ability, none of them has been identified with certainty. However, consideration of the relationship between measured intelligence and school achievement suggests one of these elements—quite possibly the most important single one. The schools are no doubt providing children with more and better experiences, from the standpoint of developing this ability, than they ever did before. The elementary schools in particular have undergone many improvements. The most effective of these, so far as their influence on children's ability to manipulate verbal symbols is concerned, are probably to be found in the newer methods and materials used in the teaching of reading. Simultaneously, many of those other factors which exist in the child's surroundings outside the schools and which help stimulate the development of verbal facility have become increasingly effective during the period being considered. There are more newspapers, magazines, and books with which children come into contact. It is not impossible that some of the learning which results from experiences gained through moving pictures and radio programs may exercise an influence in the same direction. Wide use of the automobile has greatly extended the range of experience for many children, few of whom formerly had much opportunity to travel or to talk with persons who had been outside their own immediate locality. There have been other changes in the environment that have offered increasingly favorable experiences to children in recent years. Greater freedom from strict domination in the home may be among the varied factors that have exercised an influence toward more facile verbal expression. Malnutrition has been reduced to the point where this change has possibly had some effect. Better health and less frequent sensory defects may be listed as examples of improving conditions. In short, children of the more recent period have probably grown up under more favorable circumstances, both in school and out of school, than did their forerunners who started life only a few decades earlier.

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[1] Changes in the effects of selection, which have not been investigated, might be revealed by repetition of some of the most careful studies of selective elimination, such as that which was done in Minneapolis by Miss Benson (6).

There may be some psychologists who are reluctant to give much weight to the class of influences that have just been discussed. The best evidence, however, indicates that the tests of intelligence which are in common use measure qualities that are greatly affected by educational opportunity. Gordon, in his well-known research on the intelligence of canal-boat children, found this to be the case for scores on the first Stanford revision of the Binet scales almost a quarter of a century ago (18). Since that time a long list of studies furnished extensive support for the general principle established by Gordon's observations. A recent example of such a study is to be seen in the work of Wheeler (56, 57), who repeated intelligence tests in an isolated mountain area in East Tennessee after an eleven-year interval, during which the local schools were much improved, and found that the average intelligence quotient had increased by about 10. This increase is attributed wholly to improved environmental conditions rather than to any changes of a selective nature. In the light of the accumulated evidence on this question, Stoddard recently wrote, "The concept of intelligence and of intelligence testing simply refers to delivered products whose development and utilization within the individual are conditioned by appropriate environmental opportunity," (46, p. 381). Another statement from the same volume is highly pertinent, ". . . . when homes and schools give the child what he truly needs, at all ages from the first year upward, there will be a radical revision in the norms and standards for mental tests," (p. 392). Have the homes and schools of this country made some progress in this direction during the past twenty or twenty-five years? The two foregoing chapters contain evidence that favors an affirmative conclusion. The tests through which the data that have been presented were obtained are among those commonly accepted as measuring important aspects of academic ability. This is the quality with which this study has been concerned. It is a quality upon which schools place a high premium. The facts that have been presented show that increased enrollments have not reduced the level of this ability, as measured by mental tests, among pupils entering the high schools. Instead, there is some evidence that contemporary pupils outrank their predecessors in this quality. In the light of what is known about the effect of experience on the ability measured by intelligence tests, it is entirely appropriate to look upon the results of this study as evidence that members of the large groups of pupils who came into high schools recently have developed this quality to a level as high (or higher), on the average, as that which was reached by the smaller groups of pupils formerly in attendance. The schools can properly claim credit for a share of this outcome.

Even though a large part of the improvement observed in the mental test scores of contemporary youth may properly be attributed to greater effectiveness on the part of the schools, it does not follow that the high schools should assume that their programs are now so effective that no further modifications for their improvement are needed. This study was not designed as an evaluation of the contemporary secondary school. Neither was it designed to furnish answers to all of the involved questions that should be settled before coming to detailed conclusions as to the nature of the most desirable program of secondary education. It should be clearly recognized that data of the kind which has been analyzed in the preceding chapters cannot possibly afford an answer to some of those questions. At the same time, there is in the data of this study evidence that has a direct and important bearing upon the feasibility of some of the changes in secondary education which may be considered desirable. Among other things, the facts that have been assembled here suggest that the extension of secondary education to almost all youth will be unlikely to encounter a serious obstacle in the form of limited learning capacity among members of this larger clientele. The findings of this investigation are entirely clear in their implications with respect to one point. They offer no support whatever for the proposal that the educational clock be turned back to exclude from high school any of the youth who are now attending. Instead, they may be considered as evidence that a program leading in the opposite direction is wholly feasible, in so far as the program depends upon the measured mental ability of modern youth. Almost half of the young people in this country either fail to enter high school, or if they do enter, withdraw prior to graduation. Many of these are fully as well equipped to benefit from additional education as is the average pupil now in our high schools. Proposals for extending high-school facilities after the war, so that they will be readily available to all youth, may not be criticized on the ground that most youth are "not high school material." With further improvements in the effectiveness of education at the elementary level, the proportion of high-school material may very well increase until it includes all youth except the extremely small proportion of persons (probably between 2 and 5 per cent) who can be properly termed defective and who, because of their defects, require provisions that can be made best in special schools. If we are to have restrictions on high-school attendance, some other argument for such restrictions will need to be found, for it is reasonably certain that almost all youth have such potentialities for learning that pre-high-school experiences based on the best available knowledge of education and child development will bring them to secondary-school age fully ready to proceed through several years of suitable further schooling with results that can be beneficial to both the individual and the community.

This is not to say that all youth are equal in ability. From what has been learned on this question, it is known that important individual differences exist—differences so great that thus far few high schools have provided adequately for them. But in the light of the findings that have been set forth here, it seems most probable that increasing enrollments have not been accompanied by a greater range in individual differences among pupils with respect to mental ability. Instead of greater heterogeneity in this respect, the range of measured differences in some of the recent groups for which data have been examined here is actually smaller than the range which was observed in earlier groups. But it is at the same time possible, and indeed highly probable, that the range of differences in other important qualities not measured in this study increased as enrollment grew. There are good reasons for believing that pupils have in recent years come into high school from a greater variety of home conditions and with more varied cultural backgrounds than was the case twenty or more years ago. Most important of all, they vary more than any previous generation of pupils in their interests, their aspirations, and their personal values. The fact that the great gains in high-school enrollment came at times when youth found it most difficult to obtain employment supports this view. Just at present this negative relationship between enrollment and opportunity to engage in other activities is manifesting itself, as some youth choose to work instead of continuing in high school. To put it most bluntly, some youth will come into the existing high school only when there is nothing else to do. The youth who make this choice are not as a group deficient in mental ability; among them there are many who are intelligent, aggressive, and eager to participate in significant action. When forced by lack of other choices to attend the high school, they sometimes fail to conform to its demands and restrictions. Because of this nonconformity many of them make poorer impressions on their teachers than did the typical high-school pupil of earlier decades. Temporarily, while there is a choice, some of them prefer to remain out of school to work, and others join the Navy before they reach draft age. As soon as demobilization takes away these choices, high schools will face more than ever before the necessity of providing highly varied programs to serve adequately new millions of active intelligent youth—including youth of the kind who are willing to come into traditional high schools only when there is no opportunity for them to do anything else.

Now is the time for high schools to be planning to meet the new demands that will be made upon them after demobilization takes place. Enrollment estimates should assume that the percentage of youth attending throughout the high-school years will surpass the prewar figure. This increase will require diversification of curricula far beyond anything to which we have been accustomed. There will be a place for academic courses, but many postwar youth will reject what the high schools have to offer unless their offering includes opportunities for other types of experience. Realistic study of the pressing, persistent personal problems faced by young people, no matter how slight the interest of these young people in academic questions, will be imperative. The necessity of vocational training in new fields is receiving recognition. Beyond this, there will be a need for part-time work experience, which should be available to pupils whether or not they require formal vocational training such as is given in the classroom or shop. Recreational and leisure-time activities in greater variety than have previously been available will be in demand. Finally, in order to help each individual member of this new and more heterogeneous group to utilize the resources of the school without great waste, there must be much more thoroughgoing guidance than the high school now provides. If the high school is to serve pupils who come to it with interests of every sort, it must really study each individual until those interests are understood. If, among the pupils who attend a school, the diversity of purposes is great, the school will find its efforts to a large extent futile until these diverse purposes are taken into account. If attempts to extend and improve opportunities for vocational preparation in the high school are to be very effective, the school must offer its pupils better help in choosing their occupations. If the high school is to accept youth with more varied backgrounds, it must prepare to offer more highly individualized educational programs suited to those backgrounds. In short, as the clientele of the high school is expanded to include a group of youth with more heterogeneous interests and purposes, secondary education must go beyond the mere provision of greater variety in its program and give enough attention to the individual to assure that wise choices will be made by every pupil who comes into the school which furnishes this variety of educational experiences.

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Chapter V

SUMMARY

This study was initiated for the purpose of discovering changes in the mental ability of pupils attending high schools as enrollments increased to include larger proportions of all youth. Records of enrollment show that the high schools have been receiving ever increasing proportions of the total age group from which their pupils come; they have now taken in almost three-fourths of all youth between the ages of fourteen and eighteen years.

Throughout the period of expanding enrollment educational writers have held that increasing attendance brought greater and greater proportions of mentally inferior youth into the high schools and that the average level of intelligence among pupils coming into the high schools was thereby being reduced. Examination of the evidence which is generally advanced in support of these views reveals its inadequacies. It appears that the high schools formerly retained pupils who were, on the average, somewhat superior to the remainder of contemporary youth in academic ability, but that this superiority was far less than was commonly believed. Thus, indiscriminate expansion of enrollment would have tended to bring into the high schools pupils who were, on the average, slightly inferior to those formerly enrolled, if the level of academic ability remained constant in successive groups of youth. This constancy has been assumed without inquiry into the possibility that changes have occurred.

Prior to the time when group tests of intelligence came into use, there were in the records of high schools almost no data that could be used to compare the academic ability of pupils enrolled at different periods. At present there exists little evidence regarding the level of academic ability of those pupils who came into the high schools before World War I. There is no ready means by which such data can now be obtained. Consequently, the comparisons which have been presented in this monograph are confined to the period beginning in 1916, when ordinary group tests of intelligence were coming into common use. While these tests have certain limitations, they afford the best available means of measuring academic ability. Even though these measuring instruments fall short of perfection, they measure a quality upon which the schools customarily place a high value. It is in terms of this quality, referred to in the foregoing pages as *measured mental ability*, that the comparisons which have been presented here were made.

Data of two types have been used for comparing the measured mental ability of groups of pupils attending high schools at different periods. The first of these, collected from published sources, shows that the average intelligence quotients reported on various occasions between 1916 and 1942 have not declined during that period. Instead, there is some evidence indicating a slight upward trend. The second type of data was obtained through repeating an intelligence test in certain high schools where it had been given several years earlier. The results are consistent with those shown by comparisons based upon the first type of data, in that they likewise reveal no loss in the average level of measured mental ability as enrollments increased. In each case in which a change in the measured mental ability of high-school pupils has been found through direct comparisons, this change has been upward rather than downward. These gains have been accompanied by constant or decreasing variability in all of those cases in which the data permitted comparisons on this point. Thus the extensive data that can be used to make direct comparisons between earlier and later pupils lend no support to the common view that increased enrollments have brought into the high schools pupils of inferior academic ability.

There is relatively good evidence indicating that selection has favored to some extent the retention of mentally superior students and that as enrollments multiplied this selection became somewhat less favorable. From the findings of this study, it would appear that the effects of less favorable selection among more recent high-school pupils with respect to measured mental ability have been fully overcome by compensating factors. It is suggested that these factors include both (a) more effective education, particularly in the elementary schools, and (b) more favorable out-of-school environment. An unknown portion of the apparent gains may be due to increasing "test-wiseness," as this factor has probably operated in some cases.

It may be inferred that further increases in high-school enrollments are thoroughly feasible, so far as any limitations growing out of the potential academic ability of youth now being eliminated from school are concerned. Such an extension of secondary education can probably be carried to the point at which all youth except a very small group of defectives are attending secondary school. In the light of what is known regarding individual differences in the interests, purposes, and aspirations of young people, it appears that the effective extension of secondary education to all youth will require (a) sweeping curricular changes, with a much greater variety of activity than the secondary schools now afford, and (b) a program of guidance which will enable each pupil to choose appropriately from the varied educational resources which the new secondary school will make available.

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